NEW-YORK FARMER,

AND

AMERICAN GARDENER'S MAGAZINE.

VOL. IX.] PUBLISHED MONTHLY, AT NO. 132 NASSAU STREET, NEW-YORK, AT THREE DOLLARS A-YEAR, IN ADVANCE. [No. 9.

D. K. MINOR, and GEO. C. SCHAEFFER, } EDITORS AND PROPRIETORS.

FOR SEPTEMBER, 183.

NEW SERIES—VOL. IV.

STATE HISTORICAL SOCIETY
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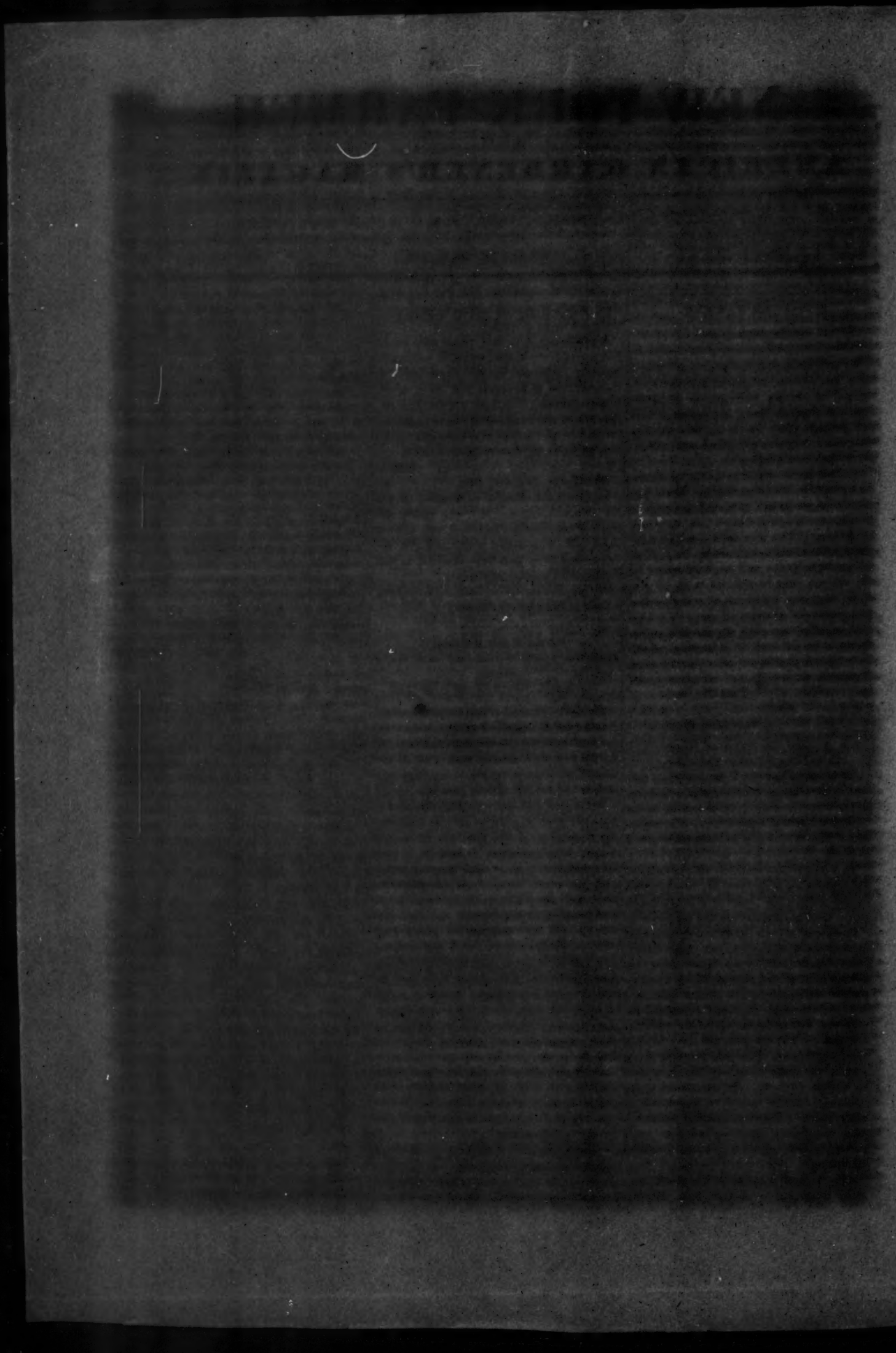

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NEW-YORK FARMER.

SEPTEMBER 1, 1836.

We publish the following extract from a letter, and shall be obliged to those who advertise, or furnish descriptions of implements, to furnish also a statement of cost and place to apply for them. We shall be also much obliged to any friend who will reply to the other queries.

"Allow me to say to you, that, in advertising implements of husbandry, where you can obtain the prices, it would be advisable to state the cost and from whom they may be obtained. Can you inform me at what price gypsum and bone dust can be purchased in New-York; and to whom orders for the articles may be sent? I wish to give these manures a trial, as also the system you pursue of rotation of crops: for I am well satisfied that they are absolute necessaries to insure success in farming. I will be obliged to you for the above information, if you can without inconvenience acquaint me. Your Obt. Servt.,

A. D.

Savannah, Georgia."

To the Editor of the New-York Farmer.

ESTEEMED FRIEND—If the following method of destroying the worms which infest peach trees is worthy of insertion in the "Farmer," it is at thy service. The experiment would probably succeed wherever it is tried.

In a recent conversation with an individual concerning fruit trees, he remarked that he had seen in the State of Pennsylvania, peach trees of such uncommon size, that he was induced to ask the owner what means he resorted to in raising them. After some hesitation, he informed him, that from the second year of the growth of the trees, he sought for traces of the gum, which is a sure indication of the worm beneath. He removed this so as to expose the aperture into the body of the tree, and then filled it with quick lime. This was repeated every month, the roots being carefully examined as well as the body. He also stated to my informant, that it would be impossible in many cases to find the worms on account or their diminutive size, they being so small at first as to be visible only with a powerful microscope.

The greater number of his peach trees were from ten to twelve years old, and seemingly as vigorous as any he had ever seen, with a large crop of fruit bending their branches to the ground.

A peach tree it is said bears only three years, and is about that period in coming to maturity; whereas by the above plan, it will continue to produce fruit for a much longer period. The high prices paid for peaches in our large cities, ought to induce farmers to give a little consideration to the best methods of preserving their trees.

J. C.

Burlington, Sep. 1st, 1836.

We are much obliged to friend J. C. for his communication. We can testify the truth of his remarks from our own experience. We have seen a peach tree, that was considered to be past help, restored to fine condition by similar treatment.

Any one can satisfy curiosity by inspecting a poor looking peach orchard.

For the New-York Farmer.

RELATIVE VALUE OF MERINO AND SAXON SHEEP.

CORTLAND VILLAGE, Aug. 28, 1836.

My Dear Sir:—A "raw and gusty day"—cold enough to make a greatcoat a luxury in dog-days—drives me within doors, and for the first time since it was made, I find myself at leisure to fulfil my long neglected, but never forgotten promise.

Perhaps I can present nothing at this time, of greater interest to the readers of the Farmer generally, than the addition of a little more testimony in relation to some of those points, so warmly mooted at this day, connected with sheep breeding—the several circumstances which determine the comparative profitableness of the rival breeds. Of the coarser wool and heavier carcassed English varieties, I know nothing, and therefore shall say nothing. My acquaintance has been exclusively with the Merinos and Saxons, and whatever weight my opinions may be entitled to, on other accounts, the fact that I have among my flocks about an equal number of the two breeds, or rather, the two varieties of the *same* breed, gives me the liberty of laying claim to at least, *as much* candor, as the mass of the disputants who have entered the lists in favor of one or the other of their respective favorites.

The actual difference between the Spanish and German families, of this celebrated race of sheep, I am convinced has been greatly exaggerated. When it is borne in mind that only about seventy years have elapsed, since Merinos were imported into Saxony, from the mother country, and that from these, and subsequent importations of the same stock, the whole Saxon family have descended, it must require a great stretch of credulity to believe that disparities so great and radical, so unaccounted for by any change of circumstances, could be brought to exist during this period, in the *same* breed, maintained *pure*. The only important causes which have operated to create a difference, if we except the circumstance of the Saxon's being descended from *picked* sheep—(the original importation being a gift, to which even national importance was attached, from one monarch to another,) are change of climate, and the neglect which the parent stock suffered in the long and bloody wars of which Spain has been the theatre. It is a well established fact that sheep changed from a moderately cold, to a warm climate, suffer a visible depreciation in the fineness of their wool, and the converse of the proposition is equally well established. This is doubtless one material reason of the superior fineness of the German Merino, and if we may trust Chancellor Livingston and Col. Humphreys,* the like effect has been perceivable in the several countries of *Northern* Europe, (with the exception of England, where extraneous causes, necessary here to be examined, have operated,) into which the Merino has been introduced. In addition to the loss suffered by the flocks of Spain, in the Peninsular War, by some of the choicest ones being driven into France by the French generals, and by tens of thousands being indiscriminately slaughtered for the subsistence of the conflicting soldiery and starving peasantry, it must be evident, that in such a struggle, this as well as every other branch of agriculture, would be utterly neglected. Such was the case to a most unfortunate extent, and the Spanish flocks have never recovered from the shock. On the other hand the Merinos of Saxony, with the utmost care bestowed on their breeding and general management, at the Electoral sheep farms of Lohm, Rennersdorf, Hohenstein, and more especially at the celebrated establishment at Stolphen, (near Dresden) could not of course, fail of

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* See preface to Chancellor Livingston's celebrated "Essay on Sheep," and Col. Humphrey's "Letter to the Agricultural Society of Massachusetts."

improving, unless the Germans have been deplorably deficient in even the "outside" principles of sheep husbandry.

The popular exaggeration of the difference between the Spanish and Saxon varieties, springs, I have no doubt, in a great measure from unacquaintance with *pure blooded* and *well bred* animals of one or both kinds. The man whose ideas of pure blooded Saxon sheep, for example, have been formed on those "long-legged, thin-quartered, flat-sided, narrow-boned, not sufficiently deep-chested, and long-necked" animals, which we daily hear called "pure Saxon," if a decent half bred Merino, or indeed a *decent* sheep of any breed comes under his inspection, and must of course prefer it. I will not say that none such are pure blooded, but I will say, that it is the result of defective breeding, and not characteristic of the race—and I will further say, that in nine cases out of ten, such animals have been produced by a cross between Saxon tups (deficient themselves, because selected, as is commonly the mistake, exclusively in reference to the fineness of the wool) and native ewes, or at best, half blood Merinos. The produce of the fourth cross are paraded forth to the world, and *sold* as "*pure bloods!*" There are those who know, with myself, that the "pure Saxons" of a certain County in this State, which shall now be nameless, were thus bred—that is, one cross of Saxon with half blooded Merino ewes, of Mr. Livingston's importation. Thus one-fourth of native blood mingled in their pedigree, yet alas! their sins are all laid at the door of the "pure Saxons."

There is another class of "pure Saxons" equally notorious, and equally often quoted. When the "fever" for importing this race first broke out, and the sheep sold for such extraordinary prices, how many vessels freighted to Europe, received orders to take in cargoes, or partial cargoes of the wonderful sheep, on their homeward bound passage! Let us suppose Capt. Tarpauling acting on these instructions. He sails for the nearest port within the prescribed limits; presents his order at the commercial house with which he has done business; and Messrs. Van Beest & Van Bruggins immediately institute the proper inquiries. Every sheep breeder within fifty leagues, it is found, has the "*pure bloods*," just as they have in this country, to the inquiry of every one desiring to purchase! The most ludicrous scene of the whole, and the next in order in the farce, presents us Capt. Tarpauling, and perchance Mynheer Van Bruggins, (who acquired their knowledge of the qualities of sheep, on the deck of a vessel and behind the desk of a Dutch counting-house!) superintending the selection of these sires and dams of untold generations of bona fide "pure bloods." In due course of time, they are landed at New-York or Boston, and sold. That they are pure blooded Saxon, "*every body knows because they were imported direct from Saxony!*" Before me lies a letter from a celebrated German sheep breeder and wool grower, who says:—

* * "From the Royal, and other celebrated pure flocks, (in Saxony) bucks sell from $75, to $150 per head; and ewes from $50, to $100—and at these prices they do not give any one his choice."

Add to this the expense of importation, and let every one judge for himself how many of the *best quality* of Saxon Sheep have been brought into our country, to be hawked round at $15 or $25 a head! The remark may seem somewhat presumptuous, but I believe it nevertheless true, that as many as three-quarters of the sheep in the U. S. called, and actually believed to be *pure*, are merely the descendants of imported German grade-sheep. The native German sheep on which the cross was made, did not differ greatly from the American native. I cannot but smile on raising my eyes to a German landscape, by Berchem, which hangs before me, to notice the close resemblance between his long-legged, lank-sided, thin wooled quadrupeds, and our native sheep. The value of the produce of such a cross, might be anticipated!

There is a variety of the Merino, dark colored, and coated with 'gum'—looking much as if he had been immersed in Pitch-mark, and the weight of whose wool diminishes about half in cleansing, which differs widely from the Saxon; and it is from an acquaintance with this variety, probably, that many have over-estimated the difference between the two families. But between the *most approved* sheep of Spain, and the *most approved* sheep of Saxony, no greater difference exists, than has been rendered, as I have shown, indispensably by circumstances, and there is no doubt in my mind, that *these* may be almost immediately *reassimilated*, by inverting the order of events which have wrought the change, or in other words, subjecting the Spanish Merino to the same treatment the Saxon has received, and vice versa. Further—take 100 Saxons "as they run" out of any large flock, and take 100 Merinos, also indiscriminately, from a large flock: from the Saxons select 25 the heaviest and coarsest wooled, and from the Merinos 25 the finest and softest wooled: put with each, a buck of their own stamp, and annually exclude those, from the original number and their produce, which evince with the least distinctness, the characteristics of their flock: how long would it be before the Saxons would be metamorphosed into a flock of "old fashioned Merinos," and the Merinos into a flock of delicate and fine wooled Saxons? But suppose instead of thus breeding with exclusive reference to a single point, ('fineness' or 'weight' of fleece,) we, as traders say, "split the difference." If we find some of our Saxons getting too delicate and thin wooled, suppose we cross them with a *good* Merino buck; and on the other hand, if some of our Merino fall below the proper fineness, suppose we cross them with *a good* Saxon buck. I have a buck, which I call Rambouillet, the produce of a Merino ewe and Saxon buck, (both however the best of their kind,) whose fleece this year weighed 5lbs. washed, and sold in with my Saxon, at 80 cents, averaging *fairly* with the lot,—making the snug little sum of $4,80 for a single fleece! Amongst my Merino ewes, I have a number whose fleeces I was at the pains to weigh, and which ranged from 4 to 5lbs. I crossed these with pure Saxon bucks, which although young, exceeded the average of 4lbs. to the fleece, and I may be permitted to say, *as* fine as *most* of their blood, as in addition to having been *selected*, at round prices, from the most celebrated flocks, their wool has been adjudged to staple with some of the best samples from Germany. I am exceedingly pleased with the produce. The lambs are generally wooled to their nostrils and pasterns, and are evidently finer than their dames.

The adventitious difference which has been created between the families of the Merino race, is not without its use. They both have their appropriate sphere. To the wool growers, the *perfection* of the Saxon variety, on the whole, combines the most advantages: to the farmer, who keeps but 50 or 100 sheep; who has not the conveniences for taking much care of them; who wants a quantity of medium wool for domestic consumption and a quick sale of the remainder; the Spanish variety is the most profitable. That the "*perfection of the Saxon*" is the most profitable, "*when properly taken care of*," I may add to my own, the testimony of that enlightened gentleman, who had so often appeared as the champion of the Spanish Merino, in the agricultural papers of this State, for the last two years. The point he distinctly conceded to me, but claimed with a justice which cannot be gainsayed, that "there were very few such in the U. S.—not one where it is pretended there are a hundred." How can it be otherwise, when new flocks are generally started on the *cullings* of old ones? The way to begin, (me judice) is exactly at the opposite extreme—with the *choicest* animals which can be purchased. One had better give $15 or $20 a head for a few, and *grow into* a flock, than give from $3 to $5 for cullings—the scum and refuse of a large flock. Such was the course which I adopted, and I believe I am reaping the benefits of it. My grown ewes averaged this year 3lbs. per head, and the wool sold readily at 80 cents. As for *shape*, all I have to say is, that if any one who asserts, and there are those who do, that the Saxons are always deficient in this particular, will do me the honor to call on me, I will show him my sheep, and let him be his own judge. My Merinos I thought did well, but they fell behind the Saxons about 30 cents to the fleece.

One word as to their relative ruggedness and capacity of enduring the vicissitudes of weather, I have done. I lay it down as an axiom, that any sheep properly shaped and coated, will endure as much, as it would be either humane or profitable to expose them to, were their power of endurance doubled. The quality of the wool is deteriorated, and a much greater amount of food consumed and wasted by flocks unsheltered in the winter. A sheep that is deep in the chest —broad on the breast, chine and loin— round and deep quartered, and covered with a thick fleece of wool, *with food and shelter*, will stand the winter well enough, be it Saxon, Merino, or what not. Last winter was the severest on record, yet hundreds, who called on me, will bear me testimony that my Saxons, during the intensest cold, stood up to their racks "uncurled"—fed well—and remained *fat*. I think the Merino would *endure the most abuse*, but I am well convinced that *either* will bear all they ever *ought* to be subjected to. Perhaps I may resume the subject on some future occasion.

I have the honor to be, with great respect, your obedient servant,

HENRY S. RANDALL.

RESEARCHES IN THE ART OF DYEING. By M. CHEVREUL.

Sixth Division.—Of the mutual actions of stuffs, of neutral compounds not saline with colored re-agents, acids, salifiable bases and salts.

The study of the preceding combinations, formed from species perfectly definite, considered as to their properties and composition, is a suitable preparation for that of a more complex character, of stuffs united to ternary and quaternary compounds, such as indigotine, hematine, carmine, alizarine, aurine, luteoline, yellow and white morines, quercitron, &c., definite compounds, which are the characteristic coloring principles of indigo, log-wood, cochineal, madder, *bois de sable*, dyer's weld, *bois jaune*, quercitron, &c., substances employed in the work-shops. This latter division includes the cases in which stuffs are present with these definite compounds, and at the same time with acids, salifiable bases, and salts.

There are two points of view from which I regard the fixation of the preceding compounds upon stuffs. The first is relative to the weight of stuff, that the same weight, taken for unity, of each species of coloring principle is capable of dyeing; the second is relative to the influence arising from:

1st. The proportion of water by the intervention of which the substances act:

2nd. The respective proportions of these substances:

3rd. The temperature.

4th. The contact of atmospheric oxygen.

The influence of this latter agent is in several cases remarkable, as I shall show in a special memoir upon the subject.

I shall here produce the following as an example. The coloring principle that I have named white morine scarcely tinges cotton cloth which has received aluminous and ferruginous mordants; but if it have proper contact with the air, the most intense yellow and brown colors are developed. I say the *proper* contact, for if the time be unduly prolonged, these intense colors will be destroyed. I shall produce many analogous facts, which will show that this operation takes place, when the color developed results from a modification by the air, of a definite coloring compound, of the same order as those of which I have spoken.

Seventh Division.—Of the mutual action of stuffs, acids, salifiable bases, salts, and complex tinctorial matters of organic origin.

After the previous inquiries pursued in the order that I have suggested, we enter at last on more complex cases, in which the subject of investigation is not a definite coloring principle which has been sufficiently studied in the isolated state in which it is obtained by chemical analysis, but a substance containing a coloring principle, combined in indefinite proportion, or simply mixed, not only with several colorless bodies, but even, in many cases, with coloring principles, by which it is more or less modified. The complex coloring matters of organic origin, employed in the work-shops, are the only ones treated of by authors who have written upon the subject of dyeing.

With regard to this art, I have two objects in view:

1st. To explain the phænomena which occur in the operations of dyeing, by investigating their respective causes; these causes will comprehend the determination of the bodies by which the phænomena are presented, and the circumstances under which they are manifested.

2d. To reduce the recipes for dyeing and the processes of the art to their most simple expression.

To attain these objects, we must surmount the difficulties arising from the circumstances that the immediate composition of tinctorial substances is far from being perfectly understood, as I have already stated. Researches of the following kind have appeared to me to be very efficacious:

After examining the effects produced when ligneous stuffs, or those of silk and woollen, are submitted to the action of the different immediate principles of a complex tinctorial matter, or of extracts which, in the present state of science, present these principles in their greatest degree of purity, I examine the effect produced, when the same stuffs are submitted to the action of the complex tinctorial matters themselves, and I seek the explanation of the phænomena presented by the study of the preceding facts.

Many facts are explained by comparative experiments made on the one hand with immediate principles, and the complex substances whence they proceed; and on the other, with the three sorts of stuffs which are the subjects of the art of dyeing.

For example: indigotine, and the indigos of commerce, studied in this manner with regard to the colors which they give to stuffs, paying attention, 1st to the diversity of these stuffs: 2nd to the diversity of the vats in which the operation of dyeing are performed, present theoretical results of great nicety. Thus we see—

1st. That pure indigotine imparts the same color to silk, wool, and to ligneou) substances whatever be the intensity of the original color (*couleur fixe'e*); consequently, that indigotine applied in gradually diminishing quantities (*de'gradation*) upon any part of these stuffs, gives a collective result of correct tints.

2nd. That these results are entirely different when the indigo of commerce is employed, instead of pure indigotine. Varying results arise not only from the nature of the stuffs, but from the specific differences of the vats employed; the reason is, that in the vats pure indigotine is accompanied by yellow, red, and fulvous coloring principles, which are in various proportions in respect to each other, and have different aptitudes for fixing upon cotton, silk, and wool. Thus a diminishing quantity (*une de'gradation*) of indigotine, operating upon silk in the blue stone vat, gives the clear tints of a greenish blue, and the obscure ones of a violet blue, whilst the intermediate tints are blue, which is caused by a yellow principle which accompanies indigotine, the influence of which is sensible in proportion to the paleness of the tint.

Experiments instituted in this manner serve—

1st. To verify the immediate analysis of tinctorial substances; as the perfect knowledge of the immediate principles of one of these substances, must explain all the phænomena presented by it in its employment in dyeing.

2nd. To explain why dyers employed in the dyeing of cotton, have often ideas of the nature of a certain coloring matter, very different to those of persons engaged in the dyeing of silk or wool, which is caused by the complex nature of the coloring matter, which imparts but one coloring principle to cotton, whilst it gives two to silk or wool. This explains the reason that calico printers admit the existence only of a red coloring principle in madder, whilst the dyers of silk, and especially of wood, willingly admit that there are three, red, yellow, and fulvous.

My previous experiments upon coloring matters, particularly upon those of log-wood, have been of great service to me, when engaged in determining the compounds to which the stuffs dyed with matters of organic origin owe their color. In fact, having long known that salts with insoluble bases, that is, those in use in dyeing, under the name of mordants, for fixing the soluble coloring principles, have, when a solution of them is mixed with a solution of the soluble principles, a tendency to form a precipitate equivalent to the *coloring principle+sub-salt*, and that this precipitate is reduced by sufficient washing to an insoluble compound of *coloring principle, and a base which sometimes performs the function of an acid*, I have been led to inquire whether similar compounds be not formed in the operations of dyeing, either when these organic coloring matters are present with stuffs to which mordants have pre-

viously been applied, or when dyed stuffs are submitted to the action of an alkaline solution, as is the practice in dyeing cotton of a Turkish red color. Experiment has confirmed this inference, for I have ascertained that cotton dyed with colors for which alum is employed, if analysed after average do not present any trace of sulphuric acid.

To this I may add, that if two specimens of red cotton *rose'* by a preparation of tin, which have been sent to me with the assurance of their having been alumed, have really undergone this operation, it will follow, that there is an operation in dyeing, in which a base at first fixed to a coloring principle or to a stuff, may be elimnated by another base which will supply its place, for the two specimens I am treating of, not only do not contain sulphuric acid, but are also devoid, or very nearly devoid, of alumina. This base has been replaced by peroxide of tin.

Finally, these experiments have proved to me: 1st. The influence that matters decidedly alkaline have in accelerating the destruction by atmospheric oxygen of coloring principles of organic origin, soluble in water; 2nd. The acidity of peroxide of tin; 3rd. The tendency of alumina to act as an acid in several combinations, especially in those which it forms with coloring principles; these results appear to me sufficient to explain why these two oxides are so important in dyeing, for fixing combustible coloring matters upon stuffs.

Eighth Division.—Stability of the color of dyed stuffs, considered in relation to heat, light, water, oxygen, the air, boiling water (debouillis), and re-agents.

The researches that I have undertaken with regard to the stability of the coloring matters fized by the dyer upon stuffs, have been pursued in conformity with the views enunciated in my "*Considerations ge'ne'rales sur l'analyse or organique imme'diate.*"—(1824.) I have not, according to the general practice, remained satisfied with observing the alterations experienced by stuffs when they are exposed to the air, but I have also, at the same time, noted the modifications experienced by specimens of the same stuffs when placed in a dry vacuum, in the vapor or pure water, in dry hydrogen gas, in dry air, and in air saturated with the vapor of water. My observations, continued during the course of several years, prove the indefinite nature and even the inaccuracy of the ideas generally received upon the subject; and they furnish an experimental basis for the theory of bleaching by natural agents alone, in which we are absolutely deficient. In short, the conclusion at which I have arrived, agreeably to what I have said in the work already alluded to, is, that the alterations of compounds called organic, that are so often attributed to heat and light, are the result of several causes which act at the same time as those agents. It is my intention shortly to present an especial memoir upon the subject to the Academy.

I have applied myself to the discovery of simple means of recognizing colored matters capable of being fixed upon stuffs, because I thought that if the degree of stability of these matters were once determined, trials might be made which would show the composition of matters fixed upon a stuff; the fact being given, whether the color of the stuff would resist atmospheric agents or not.

Finally. The second part of my course is concluded by an examination of the relations of dyeing to general chemistry and optics.

I venture to hope that the Academy will perceive in the account that I have just sketched of my labors during the ten years that I have been at the Gobelins, the reason of the scarcity of the communications that I have had the honor of submitting to it during that time. Wanting bases, being obliged to establish them myself, and having also to surmount other difficulties of a very different nature, I found it impossible to apply myself to any profound researches, before I had obtained possession, by preliminary and protracted experiments, of the whole of the subject upon which I proposed to treat.

The account which I have just given of the classification of the subjects composing the second part of the course which I deliver at the Gobelins, will enable me to present special memoirs to the Academy, without fearing the reproach of want of co-ordination, because the order of their successive publication may differ widely from that of their arrangement in the work for which they were undertaken.—[Nouvelles Annales du Muse'um D'Histoire Naturelle, tome iv., p. 409, et seq.

CHINESE MANUFACTURES.—The superior industry of the Chinese people, as compared with other Asiatic nations, is proved by their extensive exportation of manufactured articles. Besides the more important articles of tea and silk, the following may be added, —alum, white-lead, red-lead, brass-leaf, tutenague or zinc, false-pearls, glass-beads, paper, paper-hangings, toys, table and floor mats, and china-ware, with the precious metals. Alum is prepared in the distant province of Kiang-see, which supplies, we believe, the whole East with this mineral.—In British bottoms alone there were exported, in 1831, above a million and a half of lbs.; but it is probable the junks carry away to the various settlements connected with the empire a larger quantity. Tutenague or zinc, obtained from the mines of Yun-nan, used to be largely exported, until German spelter, a less pure but much cheaper article, was introduced about the year 1822, and has nearly superseded it.—The paper of China, supposed to be manufactured from bamboo-cane, is brittle, from the too copious use of alum, and is greatly inferior to the European fabric; but being much cheaper than this last, it is used even in our Indian settlements for all ordinary purposes. The Chinese porcelain, which was so largely exported before the western nations borrowed the art, is still an important article of commerce. It furnishes, indeed, all the inhabitants of the Eastern Islands, from Sumatra to the Phillippines, and the tribes from the western border of China to the eastern frontier of the Burman country, with the principal portion of their culinary vessels; even the Persians and Arabians make use of it, receiving their supplies by Bombay. The quantity annually bought by the British does not exceed in value eight or nine thousand pounds; but the Americans purchase to a much larger amount. It may be mentioned, that the total value of manufactured articles exported by the English and Americans in 1834, excluding from this computation raw silk, refined sugar, and silver bullion, exceeded two millions of Spanish dollars.—[Edinburgh Cabinet Library, Historical and Descriptive Account of China, Vol. 3.

NEW ORLEANS.—Decisive measures re about being adopted to pave New-Orleans with wood, on the principle adopted between Murray and Chambers streets, in this city.

We have seen, this week, at Leeds, a specimen of bleached flax, prepared by a York chemist, which appears to present a decided improvement in the manufacture of that article. It has created a great sensation amongst the manufacturers, and been taken for silk. It is capable of being manufactured into the finest thread for veils, lace, cambric, etc., and will supersede those articles of French manufacture. The texture is most beautiful. [Doncaster Chronicle.]

From the Farmer's Register.

ON THE NATURE, FORMATION, PROPERTIES AND PUODUCTIONS OF ARGILLACEOUS SOIL.

BY M. PUVIS.

Translated for the Farmer's Register, from the Annales de l'Agriculture Francaise.

EDITORIAL REMARKS.

It is but little more than twelve months since we first met with one of M. Puvis' publications—which one (the Essay on Lime) was the latest which he had then sent to the press. Since, we have devoted many pages of the Farmer's Register to translations from that and other of his pieces, some of which were of much earlier date, but which did not come under our view, and probably had never reached this country, until brought by our special order, and in consequence of the high opinion formed of the author's later writings, which had been seen in the last numbers of the *Annales*. In presenting these several pieces, it is hoped and believed that we have both gratified and informed thousands of readers, (through various re-publications that have been made,) and have done much to diffuse the knowledge of the value of lime as manure, and to encourage and promote its extensive application. While we have heretofore frankly stated some strong objections both to the matter and the manner of M. Puvis' different essays, we think that all of them are interesting to investigators of the nature of soils, and the action of calcareous manures, and highly valuable to those who are but little informed on those subjects, and are seeking all the instruction that they need to direct their practice. As to the main and most important opinions of M. Puvis, we could not do otherwise than approve them—for it is remarkable how closely they agree with our own, first ad-

vanced and maintained (so far as was then known,) in the Essay on Calcareous Manures. The two writers separated by the ocean, and ignorant of each other's labors, and even existence, were during the same course of time engaged in investigating the same class of subjects, and arrived (though often by different proofs, or trains of reasoning,) to the same results. The entire deficiency of calcareous earth in natural poor soils—the certainty of improving such soils by its application—and the impossibility of enriching them profitably without—the *acidity* of such soils—the effect of liming or marling a country to lessen or remove *malaria*, and its consequence, autumnal diseases—all these views are maintained by both writers—and each maintained what he then thought was as novel and unsupported by other testimony, as it was important to be made known.

The following piece of M. Puvis, though the latest to reach us, in fact preceded most of what we have heretofore had translated; and this piece, it seems, is but an abstract or new form of an earlier publication, which has not yet been seen. But though our reading and publishing of the several articles has thus been in nearly a reversed order to that of their original appearance, the injury thereby sustained has not been considerable owing to a peculiarity in the manner or form of all these several publications, which is in general a great fault, but which in this case, (and very often in other agricultural writings,) is of much use to readers, however offensive to the critic's eye. It is the repeating, in different kindred articles, the same descriptions or opinions whenever the same subjects come under view. Thus the peculiar qualities of the "argilo-silicious" soils, which are the subject of the following article, have been described in the Essay on Lime, and elsewhere, with sufficient distinctness to enable us to know them. Our inferences in regard to them were stated in a note to the Essay on Lime, (page 363, vol. III., Far Reg.,) and this entire article shows that those inferences were correct.—In fact, if M. Puvis had been investigating the nature, and treating of the improvement, of the "ridge" lands of lower Virginia, he could not have more correctly described them, than he has done in describing soils in France. The dividing ridge or level between every two rivers, or tributary streams, in lower Virginia, is precisely like the "argilo-silicieux plateaux" of M. Puvis: remarkable for the same general features of sterility—deficiency of calcareous earth—peculiar fitness for calcareous manures—*for being more or less subject to sickliness* in autumn. As examples exhibited are more impressive than general description, it may be observed, that the stiffest kind of M. Puvis' "argilo-silicious" soil, (precisely the soil of "*triste Sologne*"—) is presented in the body of land in Prince George county, which lies between Powell's Creek and Ward's Creek, both flowing into James River: that most of the neighboring level ridge lands between other streams, (and through which the mail road passes) are examples of the medium texture: and that below, in Surry, the ridges are more sandy, indeed very light, yet still exhibiting the same general qualities.—Every county in lower Virginia (if not elsewhere) will furnish abundant specimens of all these varieties of texture.—Though varying greatly as to the predominance of sand or clay, there is, throughout, the same general character. We were, long ago, forcibly struck with this very uniform character of a great extent of our country, (as described concisely in Essay on Cal. Man. p. 40, 2d Ed.) and thence supposed that there has been a similarity of geological formation, different from that of the lower and more fertile lands interesecting this sterile region, and different from that of any other region ever heard of, until we recently met with the writings of M. Puvis, and his description of precisely similar lands in France. We are rejoiced to be enabled to call his support to the aid of improvement in Virginia and other Atlantic States: for all that he says, in this article, is as applicable to our country as to France. Whether his geological views are plausible or not, we are not qualified to decide: but at any rate, they, and the facts by which they are supported, are curious and interseting.

The classification of soils by writers on agriculture seem to have been hitherto of little utility. Till now they have aimed to class them by means of their texture, or different degrees of consistency; and this method has brought together soils different in nature, properties and composition.—Hence it has resulted that the classification, instead of simplifying matters has only rendered them more complicated; and in this instance, as in some others, science, by a classification at variance with nature, has retarded, rather than advanced practice, and has introduced a vexatious confusion into agricultural works and theories. This serious inconvenience would not have occurred if lessons had been taken from practice in this question. Every where experience has taught the husbandman to divide the soil into two classes, distinct in their nature, their composition, their properties and productions: it is this unscientific (*empirique*) classification which should have been followed; and then we should not have been lost among the English "*loams*" of which we cannot ascertain the exact quality, now the "free lands," (*terres franches,*) nor "fat clays;" (*luts gras,*) of our French writers, which also occasion misinterpretations in each country.

The great author of all things, in his supreme wisdom has fortunately varied the comparison of soils but little. Among the vast multitude of simple substance of which the globe is composed, he has scarcely admitted more than three to form its surface—that part destined to support its inhabitants: these substances are silex, alumine, and lime. A greater number of component parts, by diversifying the nature of the soil, would have made agriculture much more complicated—and it is already, in the actual state of things, so difficult an art! If it had been necessary to practice husbandry upon a soil composed of numerous elements, it would have been almost entirely above human intelligence.

Among these three earths, the two first, silex and alumine, form almost the whole mass of the upper stratum, and exclusively compose more than half of it. The silex is found in the form of sand, and the alumine is scarcely ever met with alone, but it exists in the soil under the name of argil [pure clay] clay, always mixed or rather combined with particles of silex very minutely reduced.

When lime, or rather the carbonate of lime, is found mixed in a greater or less proportion with the two first earths, it modifies their nature in whatever quantity it may be found mixed with them: the compound then takes the name of calcareous soil, and its properties are changed in a remarkable manner.

Sometimes the lime is mixed with a little magnesia, which then changes all the characters of the calcareous soil and most frequently renders it barren.

With these three principal constituents there is found mixed more or less of vegetable mould, (*humus,*) the decomposed remnants of preceding vegetation, or additions made by man to increase fertility; and, finally, a small portion of oxide of iron is very often met with, which does not seem to act an important part of vegetation.

Practical agriculture has learned in each country to divide the soil into *silicious*, and *calcareous lands.** In Ain, Saone-et-Loire, and Jura, and in a great part of France, the argilo-silicious land, (*terre argilo-silicieuse*) bears the name of *terre blanche* and the calcareous lands receive names which distinguish them from it completely; in the south the argilo-siliceous lands are called *boulbeuses*, and the calcareous lands *terres fortes*, in Yonne they are distinguished as *terre de puisage* and *fortes terres*, in Aveyron the one has the name of *segallas*, and the other that of *causses;* in Berry and the Gatinais the first is called *terres de Sologne*, in Belgium and the north it is called *terres a bois, terres elytres.* In fine, practice has every where given a distinguishing name to this nature of soils, which every where offers the same composition, the same properties, the same productions and the same difficulties in its cultivation.

It is this classification, this distinction of practice that I propose to examine particularly. So long ago as 1811, struck with these two great natural and practical divisions, I published a memoir on this subject. Since then I have felt more and more the great necessity of it, and my present work, which is the study of the first class of soil, of the soils composed of silex and argil will be, in some sort, a developement of facts in support of my work of 1811. Hereafter we shall be able to return to the study of calcareous soils.

Our subject will lead us to some details of agricultural geology, a science yet in its birth, for which as we proceed, we shall collect some materials.

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*Here and elsewhere the author uses the term "silicious soils" in contra-distinction from "calcareous"—or to designate soils which are not at all calcareous. We have elsewhere used the term "acid soils" for the general class.—Ed. Far. Reg.

I. The soil of which we are going to speak is not to be confounded with the granite or schistous soils which cover the most elevated parts of the globe. These last soils offer indeed an analogy of com position and productions with the former; they are also composed of alumine and silex—but they abound in granitic or schistous fragments of various magnitudes, which are not met with in like manner in the argilo-silicious *plateaux;* they produce, as these last, the heath and broom, but the fern does not grow abundantly on them.—Their formation is not the same, the exterior characteristics and the sub-soils are different; the granitic or schistous soils seem to have been owing to decompositions of granite or schist on the same spots by meteoric influence; at other times they have been produced by the movement of partial waters in the interior basins.

The argilo-silicious soil, on the contrary, belongs, as we shall see hereafter, to a great deposite which seems to have been general; but which, however, did not rise to great heights. It covers, in France and elsewhere, vast extents, and it composes at least three fourths of our forest lands in the plains; the great forests in the neighborhood of Paris and those of Normandy are almost entirely composed of it. It is the only great shade of soil which is produced every where with striking analogies in its soil, its sub-soil, its properties, its advantages and its defects; while other natures of soil offer great disparities among themselves in the different positions in which they occur.

Its composition, in the first place, as we have previously announced, is completely identical, but it varies much in consistence, and in the faculty of retaining water, according to the greater or less quantity of clay which it contains, and as the silicious sand found in it is in a state of more or less minute division; for the experiments of Thaer, Schubler, and Cadet Gaussicourt, have proved that the stiffness of a soil and its *impermeability* (impenetrability to water) depend on the minuteness of division of the silex, as well as on the proprotion of clay that it contains. Silex in the form of coarse sand takes only one fourth of its weight of water, while reduced to an impalpable powder, such as is obtained from clay, it retains nearly three times its weight; which explains, on the one hand, the great humidity of argillaceous soils and on the other the great contraction that clay suffers either by drought in agriculture, or by heat in the arts.

II. The color of the surface of this soil, when it has been long exposed to the air, is white, which has given use to its name of white land, (*terre blanche, terrain blanc.*)

What characterises this soil particularly is that when it is dry, it is easily enough penetrated by water, but when once saturated, it admits no more; the water which then falls upon its surface remains there without being able to penetrate it; this property has caused it to be called *impermeable* soil, because in fact it does not permit the water to pass through to the lower strata.

One of the worst results of this *impermeability* of the soil is the unhealthiness which is experienced in a greater or less degree wherever this soil occurs: the intermittent fevers which are observed more or less on the borders of stignant waters are very frequently endemic on the argilo-silicious plains, although they may present neither marshes nor ponds.

This unhealthiness, it appears, may be explained in a plausible manner.

The water with which the soil is inundated, not being able to escape in any direction, remains there in a state of stagnation, the general principle of the corruption of water. It forms then in the soil a kind of interior marsh; the sun and the dryness of the air exhale a part. These waters, motionless, diminished, heated by the sun in the warmth of the long summer's days, ferment, become altered, and are sometimes so much corrupted as to become black; they are then an unwholesome drink for men; and at the same time the exhalations of a soil impregnated with corrupted water become unhealthy, as those of the borders of marshes, of ponds, and of all lands temporarily inundated, and which the summer's sun strikes upon, after the waters are drawn off. Then among the inhabitants of a district, in the midst of an atmosphere mixed with deleterious exhalations, numerous intermittent fevers occur, without any necessity for the appearance of marshes or ponds in the country.

III. Almost always under the white [or light colored] upper soil, a sub-soil is found of clayey sand (*sable argileaux*) reddish and shaded with gray, or more rarely with red veins.

Its color may enable us to form a judgment of its degree of *impermeability*, and consequently of the degree of humidity of its surface: when the whole mass, soil and sub-soil, is gray, it is more impermeable, and its upper stratum is more wet; when the inferior stratum is reddish or veined, the soil allows the surface water to penetrate a little more, and the upper layer is better drained; it is then remarkable that the gray veins which it contains are more moist than the rest of the mass. The gray color, doubtless arises from the greater abundance of clay, and the red announces a greater proportion of sand, colored by the oxide of iron.

Nevertheless in all its varieties, this stratum retains the water on its surface in a greater or less degree, allows scarcely any to penetrate into the interior of the soil.

IV. The argilo-silicious formation covers vast extents of the two grand divisions of which France is composed, the basin of the Mediterranean, and that of the ocean. In these two positions, so different, although near, we are unable to assign to the deposites of this stratum shades of difference which may very sensibly distinguish them. That which covers a part of the basin of the Rhone, the only basin of France which declines towards the Mediterranean, presents, then the same characteristics as in the other parts of this country which decline towards the ocean. Nevertheless, in the basin of the Rhone, the alluvion may be more clayey, a property which it shares with all the different strata of the surface of the soil in this basin.

The cause of this may be attributed to the numerous formations of gray clay, which we shall call granite clay, that are found in this basin; and besides, to this circumstance, that the river which occupies the bottom of this basin having a much greater descent than those which flow to the ocean, (since Geneva is 300 toises above the level of the sea, consequently in a course of 120 leagues the river falls 300 toises,) the soil there has been more profoundly agitated, the plastic clay has been dissolved in greater masses, and has given more stiffness to all these strata of the basin, and first to the argilo-silicious formation.

V. This formation, generally, covers the *plateaux*, [ridges or table lands] which separate the basins of great rivers, whenever they are not divided by elevated mountains; and when mountains divide them, this formation often rises on their slopes to very considerable heights. Thus it is found on the first steps, or ascent, of the monntains of Autumnois; it is found covering the granites of a part of Haut-Charolais, of the mountains of Forez, and rising to almost equal heights on the two slopes of those mountains which decline, on the one side to the Loire, and on the other to the Rhone—that is to say, to the ocean and to the Medeiterranean. But then the difference of stiffness is sensible between the formation on the one side of the ocean, and that on the side of the Mediterranean.

It is found at an almost equal height in the environs of Lausanne in Switzerland, of Thonon in Savoy where it rises above the alluvions of the borders of the Lake of Geneva. The great argilo-silicious table land of the basin of the Rhone, which from the gates of Lyons, covering a part of the departments of Ain and of Saone-et-Loire, reaches to the middle of that of Jura, rests on elevated *chauss'ees* of the granites of ————* near Lyons: and what is very remarkable, is that, as we have said elsewhere, the general declivity of this *plateau* lies in a direction contrary to the course of the rivers which border it; that it goes on increasing in this direction for the 20 leagues of its length, so that the *plateau* towards the heights of ———— ends by rising nearly 100 toises above the course of the rivers which bound it on the two sides.

VI. The fragments of rocks which this formation contains, are always pieces more or less rounded by the movement of waters, and the largest are generally found at the greatest depth. The strata are always horizontal, the sand is almost always coarser in the inferior strata, and its grains are successively finer up to the surface, where they are very minute. All these circumstances evidently indicate successive preci-

*These blanks occur in the French publication and probably were made necessary by the illegibility of the manuscript. In the several pieces by M. Pavis, as published, there are numerous indications of mistakes of the author's words; and sometimes others of his meaning—so manifest, that the translator has ventured to alter them.—ED.

pitations from a liquid, in the bosom of which the suspended earthy particles have been at liberty to obey the law of their gravities. It is then an aqueous deposite which has extended itself over vast surfaces. Nevertheless, it is not to be believed that this deposite has been for a length of time carried along by the waters before its precipitation, for it frequently contains fragments whose angles still remain and which have not been rolled long enough to become round. In the basin of the Seine the flints of chalk beds, which are there met with still preserve, in part, their native forms; and the fragments of mill-stone (*silex carie*) which are found in Sologne are not yet rounded, although they have been rolled; and finally the rolled flint stones which are found in the argilo-siliceous deposite of the Rhone belong to the ancient alluvions of the basin, and have not received their form in the various movements of the deposite in which they now occur.

VII. Every where this stratum covers the great formations and is no where covered by them; it is then evidently the last of the great revolution which has agitated the surface of the globe.

VIII. It does not appear possible to attribute it to fresh waters, to the formations, always partial, of river waters, which take a distinct character in each basin, and generally occupy its bottom. We do not find in it the fresh water remains so numerous in marls, as well the stony, as the earthy kinds; and, besides, when the basins of rivers not separated by mountains, this formation, occupies the whole extent of the intermediate ridges or table lands. Finally, the alluvion placed in the basin of the ocean rises on the slopes of the mountains to the same relative height as that placed in the basin of the Mediterranean; and where these mountains are depressed, the strata of this alluvion unite, and are confounded.

This stratum of identical composition which covers such vast extents in countries distant from each other, which has risen above the basin of rivers, which unites the basins of seas, can, it seems only be owing to the last phasis of the movement of great waters, of the movement of seas themselves confounded together.

It is true that few marine remains are met with in this stratum: the few petrified sea-urchins, which are found in Sologne may there be contemporary with the beds of mill-stones which crop out through the argilo-silicious stratum, and the formation of which rises beyond that of the deposite by which it is covered.

IX. This stratum must then have been deposited by the water over the whole surface; and it would not be difficult to explain how, while continuing to cover the ridges and table lands, it may have disappeared from the bottoms of the basins which it covered. When, by a course of which we are ignorant, the level of the inferior waters was lowered, currents were formed in the interior of the basins of the rivers which in the great reservoirs; the waters quitted the high lands, to collect together in the basins, their natural bed; the waters of the elevated parts of the table lands, to reach their respective basins acquired but little rapidity in their courses of short extent, and only carried off more or less of the last deposite, which was not altered in its composition. But it was not the same in the bottom of the basins; there, rapid currents of great length were established; and impelled by the waters above, they swept off the last deposite and mingled its elements with the deposites of the inferior strata.

When the waters became less rapid, the fragments which they carried along, were successively deposited, commencing with the heaviest; and as they approached a state of repose, the minute particles which the waters retained in suspension were precipitated, and formed the upper stratum, which has become the vegetable stratum, [or mould] of the lower part of the basins, and which is composed of fragments of all the formations carried off by the waters, the latest as well as the most ancient.

X. This is the place to remark that the argilo-silicious deposites which cover the *plateaux*, generally increase in stiffness as they approach the sea; thus, in the basin of the Loire, the sands of the Sologne are lighter than the same kind of table lands of La Sarthe; so also, in the basin of the Seine, the table lands of the Gatinais, and of the forest of Fontainebleau, are less stiff than the analogous ones of Bernay, and of the forest of Larche in Normandy.

The causes which have brought about this state of things may be conceived: the sandy particles must have been first deposited, and have formed the alluvions of the more elevated parts of the basins; the waters on retiring have left them successively exposed, and the fine and clayey particles, remaining last in suspension, have been progressively more numerous in the deposites as they approached the sea, and consequently have rendered the alluvions more stiff, more clayey. Thus the soil of the borders of the Seine which often shows little stiffness at Paris, acquires more as it approaches the sea: and in like manner the *littoral* soil of the three rivers, the Rhone, the Saone, and the Aisne, is lighter before their confluence, than that of the Rhone in Comtat, and that of Comtat is less clayey than that of the great plain in Arles: these facts are explained in the same manner as the preceding.

XI. Finding myself involved in the great questions of the formation of soils, I shall not hesitate, at the risk of digressing from my subject to collect here many important facts in agricultural geology.

The argilo-silicicus deposite has been very evidently the last of the great deposites which have covered vast surfaces: it is, in some sort, the last phasis, or general movement of waters, on the surface of the earth; but since then, partial revolutions seem to have taken place in the basins of large and small rivers; there are even some to which we seem able to assign an era, and which do not go beyond the historical ages. Thus many positive and very remarkable facts may induce an opinion that in the basin of the Rhone a great movement of waters must have taken place since the establishment of the Roman dominion in this country. When wells are dug at Marseilles, water is found under a stratum of gravel about 20 feet thick, at its junction with another formation on which we meet with traces of habitation, roads, Roman, Phœnician and Gallic medals. This level of the soil has then been inhabitated, two thousand years or more ago, and consequently the stratum of gravel more than 20 feet thick which covers these parts of the basin has been brought into them since, by a movement of waters which no historical recollection recals.

But if we remark further that in ascending the basin of the Rhone to Arles, to Orange and Valence, to Nimes, to Lyons, the traces of Roman inhabitation are every where covered with a stratum of gravel many feet thick—that at Bourg, situated in the same basin, are found medals, instruments of a contemporary date and of the same sort as those met with at Marseilles, and every thing which characterises an ancient level of habitation between two strata of gravel analogous to those which cover them elsewhere—we shall have good reason to believe that the stratum above the medals which have been found, must be owing to the one same revolution, which consequently must have changed the whole face of the lower part of the basin of the Rhone.

This stratum at Marseilles, and in the the greater part of the places where it occurs, cannot be owing to the ruins of habitation, to the rubbish of destruction, which raises the inhabited surface in populous cities; for the traces of habitation, the medals, the roads, mould (humus) bricks and pottery, in angular pieces, would be found throughout the whole thicknes of the stratum, whereas this is composed without mixture of rolled pebbles of silicious gravel of the same kind, covering calcareous gravels disposed in horizontal strata, identical in thickness and in composition, which could be owing only to a natural formation deposited from the bosom of the waters.

But still farther traces of this inundation are found. At the junction of the basins of the Ain and the Rhone, there exists a great plain which bears the name of Valbonne, (*Vallis Bona*;) a name evidently given by the Romans, and of which the soil is now composed of an arid stratum of silicious gravel like that which is found all along the basin of the Rhone; but we should consider as certain, that this stratum did not cover the valley when it received the name of *Vallis Bona*; it may then be believed, that the alluvion of good quality which covered this valley, was carried off by the great flood which has thrown over a great part of the surface of this large basin, all those increments of gravel which have covered and devastated the inhabitated surface. In support of this conjecture, we find in Bas-Bugey at Meximieux, and in Dauphiny, at Saint Priest, opposite the plain in question, a stratum of calcareous soil of good quality, which often rises many feet above the alluvion of gravel, this stratum, which at several points bears traces of having been torn away, rose, it may be believed, above the borders of the Ain and the Rhone; it covered con-

sequently, the plain between Meximieux and Montluel, and gave occasion to its name of *Vallis Bona*, which was preserved to it after the waters had deprived it of its qualities. An aqueous revolution then has taken place in the basin of the Rhone; this revolution must have been subsequent to the establishment of the Roman power, and to this revolution the stratum of silicious gravel succeeded, which from the borders of the lake of Geneva, to those of the sea, covers such vast extents.

We shall not continue farther the discussion of this important question of agricultural geology, for fear of exceeding the proper limits of this journal.

XII. In all movements of great waters which have taken place, each basin of a river has formed a new upper stratum which has become the vegetable stratum, (or surface soil;) and this is distinguished by shades of formation which are peculiar to itself, and which it has received from the fragments of the mountains which border upon it, from those brought by the waters of its confluents, mixed with the great general deposites. Thus are explained those analogies of soil and of formations which are found throughout the whole extent of any one basin, and in the secondary basins themselves.

We have designedly gone back to the origin of these analogies of soil, that we might recur to an important idea in agriculture. It is this: that the formations in any one basin being composed of the same fragments, and owing to the same revolutions, the soil of these basins presents throughout their whole extent a great analogy, and consequently, the practices of agriculture which have succeded in one point, may be applied, the difference of climates excepted, to the analogous formations; agrtculture perfected on some points of a basin, may give lessons almost certain for its whole extent.* Thus the study of agriculture, to become more profitable, instead of being made according to a political association, by Departments for example, ought to be made by the basins of rivers; it would give rise to many fewer mistakes, and consequently, to much more success. The rules and successful practices of a basin, should be studied anew, if we wish to make an application of them to another basin in which the composition of the soil is owing to different circumstances.

XIII. This caution, this fear of mistakes, ought to have its full effect when agriculture is practiced on the great argilo-silicious deposite which covers such vast extents, and presents every where the greatest analogy. The practice of agriculture on this deposite, might then have general rules which it would be very important to collect; but it must first be well characterized, in order that it may be every where known.—We shall therefore resume the course of our observations.

* It may not be useless to all readers to say, that by the "basin" of a river, the author does not mean merely the valley or lower lands through which it flows, but the whole area, high and low, which lies within or is intersected by, all the tributary streams of the river. Thus the basin of the Mississippi takes in the immense area from the summits of the Rocky Mountains to those of the Alleghany.—ED.

The soil and the sub-soil of this stratum, although of different shades, appear to be of identical composition, as experience daily proves in a striking manner. When by any circumstance the whitish stratum of the surface is removed, so as to leave only the reddish stratum of the sub-soil, some years of cultivation and manuring, or even of spontaneous vegetation without culture, are sufficient to give to this reddish subsoil the gray color of the rest; and, in the same manner, when this reddish earth is carried out on a cultivated soil, the shade which it gives quickly disappears by mixture with the rest, and by the effect of cultivation.

The proof of this identity is still more complete, if we remark that in digging into the lower parts filled up by the falling of more elevated portions of the soil, we find the red soil shaded with gray, or the gray shaded with red veins in the middle of the rubbish; which prove the new increment, with all the characteristics which it has elsewhree, its stiffness and its *impermeability*.

The sub-soil and the stratum of the surface, are then nearly identical, its formation throughout the whole thickness is therefore the production of the same aqueous revolution; only the oxide of iron which colors the sub-soil, loses its color by cultivation.

XIV. The effect of frost upon this soil characterizes it in a peculiar manner; the water at the surface when it is in no great quantity, often freezes in vertical threads which sometimes rise six inches, and resemble a vegetable growth. But what is still more remarkable, is, that the soil rises up by freezing much more than the greater part of calcareous or alluvial soils. New vegetables, planted, or even sown, are torn out of it in a manner truly astonishing; plantations of wood of that year, or even of the year preceding, were torn out at two different times by the freezing without snow, in February, 1831; and sowings of seapines, (*maritimes*) made the year before, were thrown out of the soil. It is therefore prudent to wait till the end of winter to make plantations in such soils, and not to dig the holes beforehand, that water may not get into them and remain; and as the effect of frost is less sensible on the parts covered with turf, the little holes, after planting, should be re-covered with turf, to prevent as much possible as new losses.

The rising of this soil from freezing, occasions besides the great inconvenience of much deeper roads than on calcareous soil.

These effects are explained in a plausible manner from the nature of the soil itself. This soil contains much silex in a state of very minute division, either free or combined with the clay; this silex as we have seen, takes a greater quantity of water than other descriptions of soil; the water which penetrated this soil expands, as we know, by freezing; it expands then at the same time the soil which it penetrates; the expanded soil rises up, and raises with itself the plants and their roots when they do not reach to great depths.

The surface of the soil in thawing first, and losing a part of its water by evaporation, is contracted and sinks upon the rest of the soil, and leaves exposed a part of the roots which cannot descend again with it because their extremities are fixed in a soil still frozen: the next day this effect is renewed, and the plant is soon partly or entirely out of the ground, according to the length of its roots.

The rising of the soil is greater in proportion as it is more clayey, because then it contains more silex in the state of impalpable powder, or it absorbs more water; it it is greater than in the ordinary calcareous soil, because carbonate of lime receives only 85 per cent of water to 100 of impalpable powder, while silex takes 280 per cent. There are, however, some calcareous soils which also greatly expose the roots of vegetables; these are the marly (*marneux*) calcareous soils; thus, in the freezings without snow in February last, our calcareous soils of the plateaux, whether *terres-mares*, or our marled lands, had more plants thrown out than our common white lands, (*terres blanches.*) We attribute this to the fact that our *terres mares* are nothing more than a mixture of the argilo-silicious soil of the plateaux with the inferior marly stratum; but our marl which contains commonly 40 per cent. of carbonate of lime, has 60 per cent. of clay or very fine silex, while our white lands contain a great deal of silex in the state of sand. Our *terres mares* and our marled lands, contain then, relatively, more fine silex than our ordinary ridge or table lands, and for this reason may expose the roots of plants still more.

XV. But with the same sub-soil, almost always clayey, the surface varies much in stiffness and tenacity; it passes from a state the most tenacious, and the most difficult to work, to the lightest sand, which is carried off by the wind; and yet under all these diversities of soil, there is found almost every where the *impermeable* red sub-soil.

When the upper soil is clayey, it is then *accidente* formed of a collection of small basins or ponds, which serve to drain it; the waters have not levelled the surface, or rather after having levelled it, they attacked it in places, and formed in it basins or hollows which receive the water of the surface, and without which it would be impossible to cultivate it.

In this case, it may be conceived that the soil and the sub-soil are in their nature clayey, of an *impermeability* almost absolute; this soil is also very wet, since it contains a great deal of fine silex, which absorbs 280 per cent. of water, and to derive advantage from it, the cultivator is obliged to add to its natural declivity by artificial beds or ridges by the plough. Wheat, rye, and most agricultural productions, succeed more or less upon it when the drawing off of the superabundant water has been effected.

The dog's-tooth grass, (*chiondent,*) agrostis stolonifera, *herbe trainasse*, the little motherwort (*matricaire*) prey upon this land and impose on it, as an absolute condition of production, the necessity of a very careful cultivation; such is, mostly, the great *plateau*, which extends from the gates of

Lyons into three departments, the Ain, Saone-et-Loire, and Jura; such are nearly, also, Puysaie in Yonne, a part of the plain of Forez in Haute Loire, and the part of Sologne in the Cher and Loire, where fish ponds are found.

But if this soil, to yield produce by cultivation, requires to be carefully drained, the necessity for this is almost as great to produce woods with advantage, especially in the most clayey variety; without this, on its surface covered with little pools, without mellowness and without strength, the greater number of large vegetables languish; the oak, particularly, is frozen on it almost every year. Then it becomes necessary that ditches, judiciously placed, may collect and carry off the superabundant waters of the surface: with this care, the aspect of the soil changes, large vegetables grow with natural vigor, and are no longer subjected to any other than the great general accidents depending on temperature and climate.

XVI. The elevated parts of each *plateau*, when the waters have had less effect, are generally of a level and sandy soil on the borders, the lower parts are the most *accidentées* and of stiffer soil. Thus in the great *plateau* or basin of which we speak, Bresse is more moist, more clayey, more *accidentée* than Dombes, which is at once more elevated and more sandy than it; and it is the same case elsewhere in the same soils.

But this great *plateau* which belongs to the basin of the Rhone, appears to be the most wet of all those of the same nature which are met with on the French soil; nowhere is it necessary, as with us, in order to derive a profit from the soil, to cut it by perpendicular ditches into small pieces ridged in the middle, to increase thus the natural declivity by artificial slopes, and finally, to add to all these labors, cultivation by bedding or water-furrows. But what increases still more in our country the difficulties of cultivation, are the rains, amounting to 45 inches annually, which keep the surface of a soil, that does not allow the water to penetrate to the interior, in a state of inundation, unless the flowing off of the moisture is hastened by artificial means. And what is very remarkable, is, as we have just said, that the soil is more clayey in the low parts of the *plateau*, where the waters appear to have carried off a greater thickness of the strata. Thus, the soil of Bresse is more clayey and more troublesome, and difficult to cultivate than that of Dombes; in Dombes artificial ridging is less necessary; ploughing in raised beds is generally sufficient to drain off the water; and sheep succeed there, while they perish almost every year in Bresse.

Fish ponds succeed well only in this clayey variety of soil; the greater part of those which were in a calcareous soil, are now dried, and yield a produce in grain and forage much superior to what they did in fish.

XVII. Two conditions are absolutely necessary for this manner of employing land (for fish ponds,) and these are found united only in the clayey variety of this soil. The first condition is a very great slope, and the second, an *impermeable subsoil*. For a good pond of some extent, there should be 8 or 10 feet of water near the dam, and consequently, at least 8 feet of slope in the surface, from the commencement of the pond to the dam; a slope certainly very great, and which is hardly to be found except in the beds of torrents.

To keep the pond full during the summer, when there is little rain, which is absolutelp necessary for the preservation of the fish, it is in a manner indispensable, that the inferior soil should retain the water, and should, consequently, be *impermeable*.

XVIII. Most frequently, when the soil is light, the surface is level, it is hardly ever inclined: there is only a slight slope on the nearest water courses; consequently, in such places, there are no fish ponds; the soil, indeed, still rests, almost always, on the *impermeable stratum*; but it is often at so great a depth, that the surface which suffers from wetness in rainy weather, suffers also from drought in dry, warm seasons.

These two varieties of land, the clayey and the light, although of the same nature and of the same formation, may be distinguished from each other, the first by the name of *argilo-silicious*; and the second, by that of *silicioargillaceous* soil.

Fish ponds in the plains of the light or *silicio-argillaceous* lands, are evidently impossible, unless they could be established on the water courses which traverse them; which would destroy all the resources of the country in forage, by covering all the meadow lands.

It is of this variety of soil that is formed, in part, the *plateau* which separates the basin of the Seine from that of the Loire, which contains such vast extents of wood, and some cultivated parts; on this *plateau*, are found the forest of Fontainebleau, and that of Montargis.

Such is also the part of Sologne, in the basin of the Loire, from Gien almost to Bourges, and which separates the Cher from the Loire: it forms a great *plateau*, which rises on one side above the vale of the Loire, and on the other, above the basin of the Cher; such are all the *landes* [sandy plains or deserts] of Bourdeaux, and a great part of those of Bretagne and of Maine. In this kind of soil, rye, buckwheat, and some fields of potatoes, are almost the only productions of the cultivated lands.

Sheep, which succeeded ill, or not at all, on the argilo-silicious lands, are often in the silicio-argillaceous lands, the only means employed to derive a profit from the soil. On these, the oak often succeeds well, and suffers less than on the other variety of soil, but the chesnut is the preferable tree.

XIX. On all the varieties of this soil, provided it is drained, resinous trees seem to become naturalized, and often grow ever more rapidly than in the mountainous countries where nature seems to have placed them exclusively. In this soil, where the richest harvests are refused to the care and labor of man, all the families of resinous trees often prosper better than in our gardens. The larch and the forest pine (*sylvestre*) the sea-pine and the laricio grow vigorously over the whole extent of this soil, when it is laid dry, and the pine *du lord* seems of all to be that which best withstands the wetness. These make an excellent alternation with the deciduous (*feuillus*) trees. A single generation of these large trees, after having enriched man with its productions, often suffices to accumulate upon the soil many inches of productive mould.

I shall not repeat here the observations which I have already made elsewhere upon this soil, the nature and properties of which, appear to have been hitherto so little attended to; however, it is necessary to repeat that in consequence of the impermeability of the soil, the *plateaux* which are formed of it, contain but few springs; because, in the first place, the rain water cannot penetrate into the interior to form and maintain reservoirs to supply them; but especially, moreover, because the interior waters cannot, but with great difficulty, escape through the impermeable stratum, to arrive at the surface. It is probable that in this soil which confines the water, Artesian wells, to give it a passage, would have a better chance of success than elsewhere.

These table lands, having in general some declivity, enough of rain water rests on the surface to injure vegetation, but not enough to form marshes. Marshes proceeding from interior water—from waters below the impermeable stratum, are then also very rare, and can only be met with in this soil, when the impermeable stratum in the bottom of the basins happened to be mixed in places with gravel, which renders it permeable.

The small number of marshes which are found in this soil, are placed in the basins of water courses where the impermeable stratum has been diluted or modified in its nature; they are of small extent, and could be easily drained, because the *plateaux* themselves have, generally, a very sensible slope.

These water courses, destined to receive the water from rains, and especially from the springs of a district, are then also very rare in these lands without springs; and those which are met with, are rapid, and have hollowed out deep valleys; because the bottom of these valleys tends to come upon the level of the great rivers which flow at the foot of the *plateau*, and because the plateaux most frequently rise several hundred feet above the level of the rivers, the argilo-siliceous alluvion of these basins has been often entirely carried off.*

XX. When the argilo-siliceous alluvion is left to itself, the herbage, which elsewhere covers the soil with a close and lasting carpet, comes up upon it weak and thin; and when the surface is badly drained, its wetness is favorable to *carex* and other species generally of little substance, and even these

* And with it, the beds immediately beneath, which have not offered resistance to the flood—such as the marly beds. The surface soil, or mould, of the bottom of the valley, rests then upon plastic clay—a bed more firm, which is not washed up by, and its particles suspended in water, and which has therefore better resisted its force, than the beds of other earth that were super-imposed.—Ed.

grow badly and slowly; they are often found accompanied by a variety of moss, which covers the surface, and still more the sub-soil when naked and exposed, with its whitish foliage. When the soil is better drained, heath, broom, (*genet*) sheep sorrel, spurry, (*spergule*) fern, the peculiar and exclusive vegetables of this soil, take possession of the surface at the expense of other growths. Sheep are here supported better than on the poor herbage of wetter soils; other cattle also feed and live upon it nearly throughout the summer. The soil derives remarkable advantages from these vegetables which it nourishes: man believes that he has a right to complain of them because they present obstacles to its cultivation; but these species, larger than the feeble grasses of turf, leave more dead remains or litter on the soil, and by a happy foresight of nature, these remains are decomposed with difficulty in this inert soil, assume the character of acid mould, (*humus acide*,) and form future resources for this unfruitful land.*—The plants, of the production of which we complain, are then of great benefit to this soil, or rather to us: they have changed the nature of the soil, they have furnished to it the mould (*humus*) which alone distinguishes its arid sub-soil, and have rendered it at last capable of producing the larger vegetables—the trees which cover it in a great many places. But in a few generations, when the previous growth of heath, or of other plants natural to this soil, has not accumulated great resources, this succeeding growth of trees is soon exhausted. It happens, then, often in this soil, which receives few of the principles of vegetation from the atmosphere, that the whole growth of woods languishes and disappears quickly from the surface; then reappears the alternate cover, or shift (*assolement*) of small plants, the producers of acid mould—and the soil, by these means, stores up new powers for new productions. In this great rotation of Nature's crops, the ages of man count but as years.

Among these soils there are some, however, more happily endowed. The natural rotation then takes a different character: the larger plants continue to live upon them; different characters of these plants only, are replaced by others, and the different families succeed each other. Thus on good mountain soils we see the beech and the resinous trees succeed each other in turn, as on good soils in plains we see the birch replace the oak, which soon reappears itself after one generation of the birch.

XXI. With this great analogy in all the principal points which distinguish these soils, with their identity of composition and of production, we still, on each particular body of table land, or ridge, (*plateau*) meet with circumstances which appear peculiar to each district, and which it is perhaps important to remark. Thus on the great argilo-silicious plateau of the basin of the Rhone, as it rises towards the south and approaches Lyons, it loses the name of Bresse to receive that of Dombes; its soil becomes more sandy, lighter, and less wet, on a great extent of soil. In the most sandy and least wet parts, one of the grasses, the *anthoxanthum odoratum* takes possession eve y year among the rye, and covers the earth like a carpet. After harvest it blooms, and its numerous heads exhale a cadaverous odor which infects the atmosphere. Some persons are inclined to regard this odor as the principle of the endemic fever of the country; but the fevers prevail where the soil is not covered with the *anthoxanthum*.

Is this *anthoxanthum* the same variety as that of the botanists? The heads, the flowers and the leaves have a great resemblance, the odor of the two plants when bruised, is little different, the smell of the flowers even has some similarity: yet there would be, apparently, good reason to doubt their identity. The plant so called by botanists, is one of the earliest blooming grasses in the spring, and that of Dombes blooms at the end of the summer: that of the botanists has an odor which is in request to give a perfume to hay; its stalks and leaves often rise above a foot; that of Dombes only covers the soil, its flowers rise scarcely six inches, and give out a smell almost intolerable to those not habituated to it. Finally, that of the botanists appears to be long-lived, while that of Dombes can hardly be biennial, for it cannot establish itself in the soil in the course of the year preceding the rye during the fallow-ploughings; it must spring up, at the earliest, in October, with the rye itself, and last three months longer than it, for at the end of October its plants are almost all dry.

If there are two different varieties, it would be still uncertain whether the smell of that of Dombes were natural to it, or arose from the climate and soil which produced it. Could this soil, in which the interior waters are corrupted at the time of the flower's blooming, injure also the odor of the plant? If the two plants belong to the same variety, the question would be decided; the alteration of odor would be owing to the state of the soil at the end of summer.

XXII. What particularly distinguishes the argilo-silicious soil from alluvial soils, and others of good quality, is, that the sub-soil, which, as we have seen, does not differ from the upper stratum, is entirely without vegetable matter, while we see in alluvial soils, and even in calcareous soils, mould occurring below the soil, or vegetable surface stratum. Here, there is only a barren clayey sand. Also, while in other soils, vegetables sink their roots to seek nutritive juice below—in this soil the roots run without sinking, because there is nothing to be found below the stratum exposed to the atmospheric influences. This circumstance explains, in a plausible manner, the quick exhaustion of the surface in trees on white land, (*terrain blanc*) and consequently their disappearance after a longer or shorter period of vegetation. It is for this reason, that, while in good soils trees often do little injury to crops, and sometimes even afford them advantageous shelter; in the soil of which we speak, they consume the resources of the surface, starve the surrounding vegetables to some distance, and wither them up, especially during the heats of summer. It is thought sufficient to account for this, to say, that "the shade *burns*." Yet, this ought to have quite a contrary effect, since it evidently shelters from the heat of the sun. But if we remark that this effect takes place in all exposures, that it is more sensible on the south side of trees where the shade does not fall, than on the north, which is often shaded, and that this effect does not occur in deep soils into which the roots descend, while it exercises all its ravages on shallow soils, where the roots run far to draw from the surface; if, lastly, we remark that the evil is much greater during droughts, that it shows itself much sooner on these points than elsewhere, that the evil is seen in the withered leaves of the vegetables, and with all the symptoms produced by drought, we should necessarily conclude that this effect is owing to the absorption of the humidity of the soil and of some vegetable principles, by the spreading roots of the tree at the expense of the crop covering the soil.

But a very conclusive fact confirms this explanation, already so plausible. A row of poplars planted on the edge of a field damaged the crops very much. I caused a ditch to be dug so as to cut the roots of the poplars; the following year the crop of wheat on one part, and of clover on the other, was finer in that portion of the field which the trees generally starved, than on all the rest of the field. It must, therefore, have been the roots, and not the shade, which injured the crops, and the roots, therefore, absorbed the humidity much sooner than they consumed the vegetable joices of the soil. Yet, I would not admit that the nutritive juices could have accumulated in the soil which had to nourish, at the same time, the trees and the crop; but I think that the decaying remains of the roots, having become a vegetable nutriment, gave the advantage to those portions of the field which they formerly injured.

* Instead of the plants above named, (which, except sorrel, are not indigenous, and perhaps not known here) let the reader suppose to be substituted the names of our broom grass, the poverty (or hen's nest) grass, pine leaves, and whortleberry shrubs, and the description and the general remarks will suit well for our poor ridge lands, either in woods, or cleared for tillage and again "turned out." These poorest of our natural soils alone, of all in this region, present an accumulation of vegetable matter, so great as to be even injurious to cultivated crops—and which, in that respect exhibit many points of resemblance to the peat soils of Britain, which are unknown in our warmer clime. But it is not merely because the vegetable products above named are slow in decomposing, that they are thus accumulated on our author's "argilo-silicious" lands, or on what we have elsewhere termed "acid soils." The acid ingredient, or property, of such soils, is itself antiseptic, and therefore tending to preserve from decomposition all vegetable matter in contact. Soils made calcareous, of course lose all acid quality, and the decomposition of these, or any other vegetable remains, proceeds rapidly. Possibly, this action of calcareous earth is not merely negative—that the effect is not caused merely by its neutralizing and destroying of the antiseptic acid—but that calcarious earth may also possess a positive septic action, which serves to aid and hasten the decomposition of vegetable matter. Many persons, who have not been guided by reasoning, chemical knowledge or research, have formed this opinion, from observing the rapid and entire disappearance of the fallen leaves on the rich limestone forests, compared to the great and permanent accumulation on the poor woodlands of Virginia. See Essay on Calcareous Manures, 2d ed. p. 31, and ch. 8 throughout.—ED.

XXIII. This kind of soil, it cannot be dissembled, requires great intelligence and constant labor to render productive. It is for this soil that the proverb was made, "*tant vaut l'homme, tant vaut la terre*," (as man is, so is the earth;) but with great care, much labor, and abundant manures, (*engrais*) it may be raised to a production which compensates the trouble and the outlay.

What particularly distinguishes the argilo siliceous soil from calcareous soils is, that in these last, crops without (aliment ry) manure (*fumier*) grow, feebly it is true, but without appearing to exhaust the soil in a sensible degree; in the other, without manure they will scarcely grow at all. To make this soil productive, there is absolute need of a stimulant to develope its vegetable powers, and the effect of the (alimentary) manure consists as much in stimulating the soil and the vegetable organs, as in supplying them with the nutritive juices. When an equal quantity of manure is given to these two soils, so different in their natures, that its effect on the calcareous soil is perhaps twice as great as on the siliceo-argilaceous soil; whence we should naturally conclude that the faculty of imbibing the principles of vegetation from the atmosphere, is much more powerful in the calcareous soils, and the vegetables it produces, than in the argilo-siliceous soil, and it is that which constitutes their greatest difference.

XXIV. But this important faculty, which nature seems to have refused to this soil in its formation, man, by a happy compensation, may give to it, with all the properties and all the advantages which distinguish calcareous soils. If he covers the soil with marl, if he applies to its surface a certain quantity of lime, or sprinkles it with ashes, or even confines himself to burinng its surface, then the nature of the soil is changed; an unusual fertility appears—(alimentary) manures act upon it with more effect, and the soil receives that happy impulse which, when it is extended over the whole surface of the country, changes its entire aspect, and produces in it agricultural wealth, the assured source of prosperity, strength and population. Lime, and the substances which contain it, would then be a very powerful means of vegetation on a soil which does not contain them; spread so as to form scarcely a two-hundredth part of the cultivated stratum, it increases with the ordinary quantity of manure all the productions more than 50 per cent., during a period of more than twelve years. The calcareous particles which it furnishes to the vegetable texture, are not a millionth part of the product itself, since lime does not form a moiety of the weight of the vegetables reduced to ashes. This surplus of production which is not furnished at the expense of the soil, (since at the end of twelve years it will still be richer than before the application of the alimentary manure,) and which does not come from the very small portions of the substance of the lime, (which does not form a millionth of the production,) comes then from the atmosphere. The soil and the vegetables which it supports, have then received from the lime, and from its mixture with the vegetable stratum, the faculty of imbibing from the great reservoir of vegetable elements, carbon, azote, oxygen and hydrogen.

We shall not now expatiate farther on the subject of improvements by calcareous substances: they demand a longer and more particular explanation which will find another occasion.*

XXV. Let us return to our principal subject. As we have said elsewhere, by a fortunate and beneficent harmony, the formation on which the argilo-siliceous soil rests is calcareous, and contains marl in great abundance; there is not within our knowledge an argilo-silicious *plateau* in which marl has not been found at a greater or less depth; generally, it is found where the ridge or table land ends on reaching the alluvions of the basins, and in the inflexions of the soil where the waters have carried off a considerable part of the deposite.†

On a great portion of the surface of the *terres a bois*, *terres elytres* of Belgium, and of the Department of the North, marl has been found. In Picardy, it is brought up from some depth; on the table lands of the three departments of ancient Normandy, it is sought at a depth of 100 feet, even of 200 feet from the surface; Puisaye obtains it on the surface (in out-croppings) and Dauphiny at a slight depth.

Our great *plateau*, which extends into three Departments, shows it on the borders and in the basins of the streams which water them. On most of the great *plateaux* which border on the Loire, and which form a great part of the soil of a dozen Departments, marl is frequently met with, and is in many cases successfully employed. The *boulbins* of Toulouse have it also, and make use of it with great advantage.

Finally the plateau which forms the Gatinais and Sologne, which declines partly to the Seine and partly to the Loire, rests every where upon calcareous deposites. Marl is found either on the edge of the plateau, or at a little depth in its first portions, or finally in basins of the streams which water them. We may then regard it as certain, that generally, there prevail under the argilo-siliceous deposite a calcareous formation and deposites of marl, which when brought out upon the surface may give it a fertility almost equal to that of the most favored soils.

Nevertheless, sufficiently numerous observations have often shown me a stratum, not calcareous, but resembling, in its exterior characters, the earthy marl, on the nature of which chemical tests alone have been able to undeceive me. This stratum, which is nothing else than what we have distinguished by the name of plastic clay, is met with from time to time on the table lands, and in the spots where we may expect to find marl; but it is still more frequently found at the bottom of brooks, where it serves as a sub-soil to poor meadows. I have found it sometimes in cysts (*sacs*) with marl, and by its side. I have met with it upon the marl, but often below it: the plastic clay should then be subordinate to the calcareous stratum, as this last is to the argilo-silicious statum, and we should hence conclude that where the plastic clay is met with, the calcareous stratum is wanting—has been carried off—and consequently marl will not be found.

If this law of super-position exists, as is probable, it may be of great use in searching for marls; but observe, that the clay does not exclude the marl, except upon the spots where it is found; and that it is no proof of exclusion on the neighboring portions. The earthy strata of the surface have been greatly warped (*tourmente'es*) and displaced; they are, therefore, even in the same district, far from occupying the same level, and from being regularly met with at the same depths; nevertheless, in this disorder, great as it doubtless is, the law of super-position which we have noticed does not cease to exist.

XXVI. Marl and lime are powerful agents of fertility in this kind of soil; but for both, and particularly for lime, it is necessary that the soil should be drained, or they must be applied to it in quantities resembling those of the English. With this condition of the soils being invigorated [by draining,] these two agents have already changed the face of extensive districts, which have been doubled by their means in wealth and population. An age ago, Norfolk, now a county of classic agriculture, was covered with heath; it is marl which has rendered it capable of bearing that succession of crops which makes it rival the most favored soils in fertility. One-third perhaps of the cultivated soil of England and Scotland has received, and still continues to receive, from lime, an impulse of fertility which raises the mean product of their fields to, at least, a half more than the same soil produces in France. Marl and lime, in Germany, have changed the aspect of whole provinces. Italy, by lime, has improved the culture of large wet *plateaux*.—America renews by lime the exhausted fertility of vast plains, from which cultivation had demanded too much without returning to them a sufficiency of manure.

In France, La Puisaye in Yonne, has been trebled in value by marl: half the territory of the Department of the North owes its classic cultivation to marl and lime; many cantons of Normandy, the *Arrondissement* of Bernay, the environs of Lisieux, seek for marl at the depth of 200 feet; and finally in Sologne the use of marl has already improved great extents, but unfortunately it is more rarely found there than in other places.

Lime in the three Departments of Nor-

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* And which has been already presented to the readers of the Farmers' Register in Vol. III. in M. Puvis' essays on lime and marl —Ed.

† Even in this important respect, the resemblance holds between the argilo-silicious lands of the author, and the "acid" ridge lands of lower Virginia, and probably of Maryland and North Carolina. Though not the marl described by M. Puvis, a calcareous statum of fossil shells underlies, at various depths, nearly the whole of this vast region: and though it has as yet been reached for use only where its out-croppings show at the surface, in future times, when the value of this improvement will be properly understood, this bed will be found and obtained by deep pits, almost in every neighborhood, and for the use of large spaces which are now considered destitute of, and entirely debarred from this manure.—Ed

mandy has produced effects more numerous, more extended, but yet more recent than marl; a mine of coal (*houille*) of middling quality, worked during the last few years, there furnishes fuel for a great number of lime-kilns, three-fourths of the product of which are employed in agriculture. La Sarthe, Maine-et Loire, which have employed lime for less than forty years, see their agriculture enriched in proportion as its use is extended.

The Department of Landes, with its barren sands, is covered with harvests by the the application of lime to its soil: there is not perhaps an argilo-silicious plateau, in France, on which trials of marl and lime have not been made with success. We are far, it is true, from a commencement of experiments in their use on a large scale, but it is already a great point to have begun.

Nevertheless, as it appears, scarcely a fourth part of the argilo silicious soil can have been improved by either of the means; if they were extended to the other three-fourths, it is not believed that there is any exaggeration in saying that there might result an increase of an eighth in the whole production of the French territory; an immense result, doubtless, and which would not be the only one; for a multitude of observations and arguments, as well as the actual healthiness of the lands where lime and marl have been largely used, should induce a belief that on this soil, improved by the calcareous principle, the salubrity which it wants would reappear with the fertility.

XXVII. When marl and lime are wanting, or at too great a distance, or too dear, their place may be supplied, and, on this soil which requires to be stimulated, an impulse of fertility may be given analogous to that produced by the calcareous agents.—Paring and burning is a resource always certain for these soils; there is then a production of lime in the calcined vegetable particles. The vegetable powers produce potash and lime even in soils which appear to contain none; paring and burning brings into play these active principles of vegetation, which although in small proportions, exercise all their influence on the soil; and moreover the clay undergoes a modification which seems to produce upon the soil an effect similar to that of lime, and, like it, to develope, in a high degree, the faculty of imbibing from the atmosphere the elements of the growing plants.

From the Farmer's Register.

ANALYSES AND QUALITIES OF MAGNESIAN SOILS.

BY M. PUVIS.

Translated for the Farmers' Register, from the Annales de l'Agriculture Francaise.

[The following extract is taken from the *Excursion Agronomique en Gatinais*, of M. Puvis, his publication which next succeeded the foregoing article, and part of which is suited to follow in connexion.—We shall present such parts as may throw light on the other communications of this writer, or otherwise, may seem likely to furnish agricultural instruction.

This part is selected as presenting specimens of a new class of soils, those containing magnesia—and to which ingredient, the author attributes their stability. The facts presented are novel, (at least to us,) and also interesting: but the author's deductions from these facts, we dissent from altogether. Our views, in contradiction to our author's will be postponed until his opinions have been presented.]

Plateu of Gatinais.

At some distance from Paris, when we leave the valley of the Seine, after having ascended a hill of considerable elevation, we find on the summit the silicio-argillaceous plateau; a great part of the forest of Fontainebleau is situated upon it, as is that of Montargis; this plateau separates the basin of the Yonne from that of the Seine. Silex prevails there in the state of sand; these sands serve as materials for the brown free-stones (*aux gres a cement calcaire et a cement siliceux*,) which are met with in only one part of the plateau; but when the free-stone is wanting, there is always found a great number of flints, which by their form and covering greatly resemble those belonging to chalk, which are found so abundantly in the basin of the Seine as far as the coasts of the sea. Chalk is found on the surface in many places below Paris; but above, it is most frequently covered with many other strata which keep it from the surface; and nevertheless, flints are very numerous in the soil of the plateau. In the same manner, in those of Dombes and Bresse we find the rolled peboles of the Rhone, so numerous in all the formations of the basin; so the argilo-silicious plateaux almost always contain fragments peculiar to the formation of the basins which they overlook.

The fragments of the lower parts of the basin which are found in the argilo-siliceous alluvion of the plateau, would prove, if that had not already been established, that this formation is the most recent, that it was general, and that it took its elements even from the bottoms of the basin, and that it covered these bottoms as well as the high plains, or ridge land.

The Estate of Barres.

At some leagues from Montargis, beyond Nogent, we reach Barres, the property of M. Vilmorin.

This property, which he purchased thirteen years ago, contains 600 *hectares* (1,200 arpents.) His agricultural experiments, his desire to undertake great improvements, were too much confined in the neighborhood of Paris. To be successful on a soil of good quality, was not enough for his activity and his desire to be useful; he therefore made a purchase here on a soil of little fertility, and in his hands, this property has become quite an experimental torm. It could not have been better chosen for this purpose, because the land is composed of the two kinds of soil which form the district.

The property is divided into two parts by a small valley, containing 50 arpents of pasture, meadow and marsh, which are divided between the two domains; the eastern part belongs to the calcareous plain whioh unites with the calcareous plains of Yonne, without, however, being of the same nature as they: it composes two thirds of the property, that is, 800 arpents. The western part, which is more elevated than the eastern, belongs to the argilo-silicious plateau of the Gatinais; of the 350* arpents which compose it, 150 are sloping, and form the passage from the plateau to the valley. These 150 arpents partake of the two natures of the soil; they are of good quality. The remainder, 200 arpents, belong entirely to the plateau, and are composed of sandy sub-soil mixed with angular flints of chalk.

This property offers greater resources in forage than most of the neighboring estates: besides the meadows of the valley, just spoken of, it has some of considerable extent on the Vernisson, a brook which waters the country.

I. The calcareous soil of the plain rests sometimes on a white, granulated marl, which is easily crumbled, and sometimes on a hard rock, which resists the atmospheric influences; it seems to make an exception among those of its class and appearance; its exterior characters would cause it to be esteemed fertile in a great part of its extent; it shows a sufficient stiffness, a dark color which announces a sufficiently strong proportion of mould, and often even the chestnut color, the ordinary indication of a good soil.

It is especially in spring crops that this soil shows its inferiority; oats, barley, and spring vetches come up well enough after sowing, but they are without strength at the time of heading. Clover, lucerne, and sainfoin, take well when sown in the spring; at harvest, the cereal plants cover them; they are vigorous enough, and preserve a good appearance even during autumn and winter; but when the time for shooting arrives, they put up only a small number of stalks.

When the soil remains uncultivated, it is badly covered with turf, produces thistles, euphorbia, and other plants of no use or advantage to the cattle that run upon it. It suffers from wetness. Sheep upon it take the rot; but it suffers still more from drought, which seems to render the stalks of plants stationary upon the soil.

II. The calcareous plateau of which we speak here is very extensive: it reaches from Montargis to beyond Barres, more than 10 leagues in length.

This kind of soil appears to be peculiar to this part of the basin of the Seine; the neighboring calcareous soils which appertain to the basin of the Yonne, present entirely different characteristics; they are dry, it is true, but with a vegetable stratum, they become covered with wild legumineous plants, easily produce clovers, sainfoin, lucerne, and in wet springs, spring crops succeed upon them.

These soils have then something peculiar in their nature which makes them a troublesome exception in the class to which by their composition they naturally belong: they present an agricultural question of great importance to study, and almost new,

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* In the original, this is misprinted as 250.—Tr.

and they are applicable to sufficiently great extents of soil, since they occupy more than ten leagues in length.

The analyses made of them by M. Henry, at the request of M. Vilmorin, are very interesting, and are as follows:

No. 1. A coarse gray land, the earth of the surface composing at least three-fourths of the ploughed soil of the plain.

10 *grammes* of this earth gave:

Silex,	2.45
Alumine,	0.35
Carbonate of lime,	3.85
Sub-carbonate of magnesia,	0.23
Per oxide of iron,	0.41
Humus { Soluble, 0.12 / Insoluble, 1.70 }	1.82
Water,	0.58
Loss,	0.31
	10.00

The 18 per cent. of *humus*, soluble and insoluble, which this analyses gave, may cause a suspicion that the sample furnished contained more of it than an average of the soil. The proportion of *humus* would be quite extraordinary, since lands the most fertile contain scarcely 10 per cent: and there are hardly any except marsh or alluvial lands which contain it in that proportion: it is nevertheless established by this analyses that this soil contains a great proportion of *humus*, especially of insoluble *humus*.

No. 2. Represents nearly a fourth part of the extent—the portions where the vegetable stratum is very thin, where it is not ploughed on account of its deficiency in fertility, and is used as a sheep pasture.

10 *grammes* gave:

Silex,	1.80
Alumina	0.20
Carbonate of lime	6.90
Sub-carbonate of magnesia	0.47
Oxide of iron	0.27
*Oxide de Magnesie** [manganese?] a trace	0.00
Water	0.20
Humus, soluble	0.05
Loss, and charcoal of insoluble humus	0.11
	10.00

This earth, the least fertile of all those analyzed, contains twice as much carbonate of lime and of magnesia as the former, the color also is whiter. It appears to receive its change of color from the *detritus* (or broken down fragments) of the friable rock on which it is based; its composition is almost identical with that of the sub-soil No. 4, of which we shall give the analyses below.

No. 3. Sandy earth of the calcareous plain belonging to those portions of the plain, which, in the revolution that carried off the silicio-argilaceous stratum, preserved a part of it now mixed with the soil of the plain.

10 grammes of this earth contain:

Silex	7.90
Alumine	0.67
Sub-carbonate of lime (represented by *chlorure*, 0.18)	0.16
Sub-carbonate of magnesia	0.02
Oxide of iron	0.47
*Oxide de magnesie** [manganese?]	0.03
Humus, soluble	0.15
Water	0.35
Loss and charcoal of insoluble Humus	0.25
	10.00

This earth presents a great difference in composition from the preceding, since it contains 80 per cent. of silex and scarcely 16 thousandths of carbonate of lime, and 2 thousandths of carbonate of magnesia.—Yet its properties, its productions and its defects, are nearly the same as those of the preceding numbers. On the other hand, it would seem by its composition to be almost confounded with the sandy sub-soils of the plateau lying on the other side of the valley; but it produces neither heath, broom, nor sheep sorrel, &c.; plants characterizing those sands—and it agrees, as to cultivation; with Nos. 1, and 2, and like them, spontaneously produces euphorbia, thistles and other plants useless to cattle.—It possesses then those common properties of an active agent which must be common to both, which makes them a distinct class; and this agent can be nothing else than the mixture, or perhaps combination of the carbonates of lime and magnesia.

These two principles, therefore, have a very great effect upon vegetation, since 16 thousandths of carbonate of lime joined to 2 thousandths of carbanate of magnesia are sufficient to change entirely the nature and products of the soil. But let us pursue our analyses before making a deduction of all their consequences.

No. 4. Sub-soil of the plain. Its color is reddish, as is that of many calcareous soils of good quality; but having been neither affected nor modified by the waters of the last revolution, in consequence of the shelter given it by the upper stratum; and not having been exposed to the atmospheric influences, it may be regarded as the type of the deposite which forms the soil of the plain, the deposite anterior to the silicio-argilaceous formation.

10 grammes of the sub-soil of the plain gave:

Silex	0.39
Alumine	1.27
Carbonate of lime (represented by *chlorure*, 8.20)	7.41
Carbonate of magnesia	0.41
Oxide of iron	0.31
Oxide of magnesia	0.00
Water	0.06
Humus, soluble	0.05
Loss	0.10
	10.00

This soil is a species of marl which contains 74 per cent. of carbonate of lime, 4 of magnesia and 12 per cent. of alumine: its composition is quite similar to that of the analysed soils of the plain.

III. These analyses may afford us important inferences.

These soils evidently make, as we have seen, a distinct class of the silicious soils. Their properties seem to differ at least as much from those of calcareous soils, properly so called, which produced spontaneously the small species of clover, on which leguminous plants of different species succeed easily, and manures almost always secure good crops. It is not then to the carbonate of lime that they owe their inferiority: its action, on the contrary, seems to be nullified, since the characteristic properties of calcareous soils appear no longer to exist in these. Nor is it more to the silex, the alumine, nor the oxide of iron, which are found in abundance in all good soils, that this difference can be attributed. Then, of all their constituents, there remains only the magnesia to which can be owing the characters which distinguish them from their analogous soils.

It has been already fully admitted in principle that magnesia is unfavorable to vegetation. The English chemist, Tennant, formed this conclusion from the analysis of a lime which struck with sterility all the soils to which it was applied. In America the use of a magnesian lime quickly wore out (*fatigue*) the soil; and Davy has admitted it as a truth. Some trials on a small scale have shown me that while in a calcareous soil, beans, when sown, sprouted soon, and came up vigorously, in the same soil modified by an addition of magnesia, germination was retarded, and the stalks especially had only a feeble and tardy growth: yet Thaer calls into question the soil being made sterile by magnesia; and opposes to the conclusions of Tennant, that Einhoff has analyzed a very fertilizing marl which contained 20 per cent of magnesia: and farther, it results from a careful analyses, that the mud of the Nile, which we know to be so fertile, contains a large proportion of magnesia. From these last facts it may be concluded that the magnesian mixture in the soil may indeed, under certain conditions yet unknown, not be injurious to fertility: but there still remain multiplied facts, and the results of observations, of which our whole plain presents us with a new and great example, that many magnesian soils are unproductive.

But how does magnesia occasion barrenness in a soil? This problem is doubtless of difficult solution, but very important, since it seems probable that if we knew the causes which render magnesia unproductive, it would perhaps be possible to remedy them; we shall attempt to point out some *data* which perhaps may indicate the course.

And first we will remark that the magnesian mixture takes from the soil all its characterestics of calcareous soil, deprives it of all the advantages which always accompany the unadulterated mixture of the calcareous principle, and gives it a character peculiar to itself, which distinguishes it whether by its mode of acting on vegetation, or by the vegetables which it spontaneonsly produces, to the exclusion of those produced by the calcareous soil.

Still farther, it would seem, that magnesia takes from the carbonate of lime the property which eminently distinguishes lime

* So in the original.—Ed.

and all its compounds; that of rendering *humus* soluble, and that it tends on the contrary to render *humus* insoluble, in proportion as it is accumulated in the soil by cultivation. In fact, the great proportion of insoluble *humus*, which the analyses have found in the soil which composes three fourths of the cultivated plain, although a part might have been owing to an accident, could not proceed from spontaneous vegetation in this soil which is almost always under the plough, and which produces few plants. It proceeds then from cultivation but cultivation does not furnish insoluble *humus;* the *humus* of the manures then have passed into this state in the soil.—Now, it is not the lime, the action of which consists in rendering *humus* soluble, that can have produced a contrary effect; neither is it the silex nor allumine to which it is attributable; it must therefore be charged to the magnesia alone, and to this circumstance we may ascribe the unproductiveness of magnesian soils, in which manures, instead of benefitting the plants cultivated on the soil, pass into the state of insoluble *humus*.

The carbonate of magnesia has, besides, the property of retaining more water than all the other earthy combinations. According to the experiments of Schubler of Hoffwyl, it receives and retains four and a half times its weight. It may be possible that it communicates to the soil in which it is found, the property of retaining a quantity of water, which at first would be injurious to vegetation. This would explain the cause of the rot among sheep on this soil; but this water, after having injured vegetation, would not continue in the soil, for it suffers much from drought in the spring.

In this state of affairs, and in a question so important, on which doubts are accumulated, and facts and opinions are arrayed in opposition, it is a great and noble agricultural problem, that the proprietor has proposed for himself to subdue this rebellious soil and force it to yield good crops; we shall see hereafter that this object has been, in a great measure, obtained.

IV. After this long discussion on the magnesian soil of the plain, we come to the soil of the *plateau:* this kind of soil composes a great part of the *arrondissement* of Montargis, especially in the south and south-east portion; it covers besides almost the whole extent of the *arrondissement* of Gien on this side and beyond the Loire. This soil has received the name of *terre de Sologne*; the only differences which characterize the parts sloping towards the Seine and those which slope to the Loire, are the chalk flints in the basin of the Seine and the fragments of different varieties of silicious rocks in the portion of the *plateau* which slopes to the Loire.

The soil of the *plateau* of Barres offers every where a pure clayey sand, which contains in great quantity the chalk flints of the basin of the Seine, and varies little. Yet it is dry or wet, according to the sub-soil on which it rests; when it is based immediately on the calcareous rock of the plain, it is dry; and it becomes wet when the sub-soil is the reddish silicio-argillaceous stratum which does not allow the water to pass through, and consequently preserves the moisture of the surface.

This soil, compared to that of the plain, is not of difficult cultivation. Rye, potatoes and buckwheat, grow well enough upon it; with manures, artificial meadows succeed; and trees of every kind, leafy (*feuillus*) and resinous, shoot up vigorously. On the whole, this portion of soil which touches the calcareous *plateau*, on which besides it rests, is superior in quality to the parts of the *plateau* which are more distant from it. It is even of more easy cultivation, and offers especially more resources than the magnesian soil; nevertheless, it contains no calcareous parts, heath, broom, and wild sorrel, which every calcareous mixture puts to flight, are met with on this soil in all parts of the 200 arpents of it which are left untilled.

V. The rest of the soil, under the plough, of which the property is composed, presents a gentle slope, on which the owner's house is situated. This slope forms the passage from the *plateau* to the plain, going along the valley; it offers 150 arpents of pretty good soil, suitable for all productions, for wheat, artificial grasses, trees, and especially for oaks; this soil is due to a mixture of the soil of the *plateau* and of the plain, but the mixture is not uniform.

VI. Lastly, it remains for us to speak of the little valley which separates the two parts of the property.

This narrow valley receives the waters of the plain and the *plateau;* it contains a great number of springs, which are doubtless the filtered waters of the two *plateaux* which have no visible springs. It is very remarkable that the springs come almost all of them from the side of the calcareous plain, the silicio-argilaceous plateau with its *impermeable* sub-soil, has scarcely admitted any filtration, so its side furnishes few or no springs in the valley.

A great part of the bottom of the basin is marshy, requires draining and seems to us very susceptible of being drained; one part is in pretty good pasture, another in tolerable meadows, and the rest in marsh, which is mown for litter.

The calcareous rock shows itself from time to time at the bottom of the valley.—The upper stratum of the soil, belongs rather to the magnesian soil of the plain than to the silicious soil of the *plateau.*—It is firm in all the parts which the interior waters have not diluted. Works judiciously made in the marsh have commenced its draining, the results obtained and a sufficiently great slope, promise, as we shall see hereafter, success to the undertaking. Vegetation in this valley is active, the trees are fine, and if the magnesian principle, as is probable, occurs there, it does not seem to injure vegetation; in this inundated soil, some principles probably exist which neutralize the destructive effect of the magnesia. * * * * * *

REMARKS.

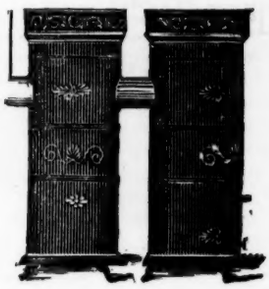
It seems a singular and illegitimate conclusion of the author, that the sterility of the soil of "the plain" is caused by the small quantity of carbonate of magnesia contained. It would have been much more plausible, if the very large proportion of carbonate of lime contained had been considered as the true evil. The soils giving analyses 1 and 2, are stated to be specimens of the whole calcareous and magnesian plain—and No. 4 shows the sub-soil common to both, and to the whole plain. In these two varieties of the same general kind of soil, the proportion of carbonate of lime is 38 per cent. in the first, and in the second, 69 per cent. —and the sub-soil of both, (No. 4,) has 74 per cent. Surely these large proportions of carbonate of lime, are sufficient to account for sterility, after the continuance of exhausting and bad tillage for time immemorial, without looking for that cause in the presence of carbonate of magnesia, which these same three specimens contain respectively in the very small proportions of 23, 47, and 41 thousandths—or less than the half of 1 per cent. We do not believe that this earth (in much larger proportions,) is injurious to soils—but infer the reverse, from the great similarity of its chemical qualities to those of carbonate of lime—and from some of the richest soils in the world containing carbonate of magnesia. Thus M. Puvis himself states that it is in the soil of the rich valley of the Nile—and we have found it in the celebrated alluvial soil of the Red River. The authorities brought to sustain the position that the magnesian ingredient is injurious to fertility, if examined, are worth as little as the reasoning. Tennant, it is true, attributes injurious effects to the magnesia contained in certain limestones; but it is to magnesia brought to its *caustic state*, by the burning of the limestone, and so applied to the soil. This may well be the case, and all the injurious effects of such manure, referred to by our author, may be true, and yet the mild *carbonate of magnesia*, as it exists naturally in soil, may be either harmless or beneficial. Still less does Davy's view sustain this opinion of M. Puvis. That great agricultural chemist quotes Tennant's discovery and statement, but without seeming to concur entirely in the asserted ill effects of even caustic magnesia—and he certainly contradicts the notion that a natural and small proportion of the carbonate is injurious, by referring to the valuable qualities of the Lizard Downs, which have that rare ingredient.

But putting aside M. Puvis' deductions, the facts as to the presence of magnesia, and the prodigious amount of calcareous earth in this poor plain, are sufficiently worth attention. We cannot, however, presume to reason with regerd to facts which are so concisely and imperfectly presented, or to explain away difficulties which oppose any general and uniform deduction. But we will venture to hint our opinion, that these highly calcarcous plains of France, were at some far remote period immensely rich *prairies* like those of Alabama and Arkansas: and that the latter, if exposed to a similar long course of exhausting tillage, will hereafter be as poor, and as difficult to be improved, as these calcareous plains of France, or the chalk *downs* of England.

Chamber Stove.

Parlor Stove.

Hall Stove.



REMARKS ON THE STRUCTURE AND PRINCIPLES OF OLMSTED'S STOVE, FOR BURNING ANTHRACITE COAL.

The Plate (see Frontispiece) represents three varieties of this stove, adapted respectively to parlors, to chambers or offices, and to halls or large open rooms, as stores and churches. The *Parlor* and *Chamber* stoves are designed to stand close to the fire place, being connected to the chimney by short pipes which proceed from the back of each cylinder. The *Hall* stove is intended to communicate with a distant flue, by a smoke pipe.

In the construction, the inventor (Professor Olmsted of Yale College) was guided by principles strictly philosophical. After it was observed that the volume of aeriform products, arising from the combustion of anthracite coal, is excedingly small, when compared with that from wood and other kinds of fuel, it was perceived, that a great loss of effect must accrue from transmitting the heated current through a large open pipe. Thus in figure 1., which represents a pipe eight inches in diameter, it is obvious

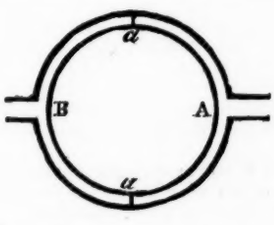
that the heated air, which is itself a bad conductor of heat, would part with its heat slowly except within a small distance from the surface, such as is represented in the shaded circular ring, while the large portion of the capacity of the pipe, constituting the vacant space within this ring would be nearly ineffectual. Hence, it would be only after circulating through a very long pipe, that the heat could be all absorbed and distributed to the apartment.

To remedy this difficulty, several different expedients have been adopted. Some have employed a *small* conducting pipe, or a series of small pipes, with the view of securing a greater amount of surface in proportion to the interior vacant space.* But although a comparatively small pipe will serve to convey off the heated air from an anthracite coal fire when well ignited, yet on first kindling, when the volume of gases is much greater, the draught of such a pipe is insufficient, and smoke and noxious fumes flow into the room. Such pipes also are peculiarly liable to get choked by the deposite of soot.

Others have attempted to obviate the difficulty in question, by using a *flattened* pipe, or some equivalent contrivance, where the opposite surfaces are made to approximate to each other, and the proportion of vacant space is greatly diminished. A fair specimen of this structure, is seen in the ascending cast iron pyramidal pipe of Doctor Nott's stove.

It occurred to Professor Olmsted, that the same end might be more conveniently attained by the combination of two similar figures, like two concentric cylinders. Here the parallel surfaces may be brought extremely near to each other, so as to force the heated current into close contact with the absorbing surfaces, and yet space enough be left to secure a good draught. For example. if we make the outer cylinder 14 inches in diameter, and the inner cylinder 12 inches, leaving only 1 inch distance between the two, the space occupied by the circular ring will be proportioned to the difference between the squares of the diameters, and consequently be proportioned to the difference between 144 ($=12^2$) and 196 ($=14^2$); that is, it will be as the number 52, and therefore proportioned to a pipe 7¼ inches in diameter.* In like manner, a seven inch cylinder within a nine inch, leaves a space equivalent to that of a pipe more than 5½ inches diameter.

We have then, in this combination all we can desire, namely, an ample draught along with a great amount of surface, and yet a vacant space so narrow that the heated current cannot flow through it without being brought closely into contact with the absorbing surfaces. Indeed, so small is the volume of aeriform products arising from the combustion of anthracite coal when well ignited, that, by making a separate pipe for kindling, (which is closed as soon as the fire burns freely,) the two cylinders may be brought within *half an inch* of each other as is represented in figure 2, and yet, when free from soot, a good draught obtained. It has, however, been found preferable, on all accounts, to leave the distance ¾ of an inch. The employment of this principle, namely, *a greater proximity of the opposite absorbing surfaces* than has been heretofore used, constitutes the first peculiarity of Olmsted's stove.



But, secondly, it has been ascertained, by experiments in transmitting heated air through a pipe, that the absorbing effect of the pipe is increased by making the heated air descend and ascend, as in traversing a succession of elbows.* In drums somewhat resembling this *Radiator*, inasmuch as concentric cylinders have been employed, the usual practice has been to place the two cylinders so far asunder as to lose that signal advantage of *closeness of contact* between the heated current and the absorbing surface, an advantage which is gained only by a proximity of the parallel surfaces. Moreover, it has been usual to introduce the heated air in such a way as to make it ascend through the open space between the two cylinders, flowing loosely from a pipe in the bottom to one in the top of the drum. But a peculiar advantage, (which is remarkable considering the simple manner in which it is gained) is secured by employing a vertical partition,† which forces the heated air first to descend on one side, and then, flowing under the inner cylinder, to ascend on the other side, thus traversing the surfaces of the two cylinders in a manner the most favorable for the perfect absorption and distribution of the heat. But, thirdly, since the inner cylinder would thus become rapidly heated, it was necessary to introduce a current of cold air into the central space, which was easily done by letting an open pipe pass through the bottoms of both cylinders. By this means the colder air of the room, which is always nearest the floor, would flow into the vacant space, as air flows into the chimney of an argand lamp.

These three principles combined, namely, *a greater proximity of the absorbing surfaces* than had before been employed,—a *vertical partition*, causing the heated air to traverse those surfaces more effectually,—and *a current of air* flowing through the central parts of the radiator, constitute the peculiarities, and form the grounds of the claim to originality in this stove.

*The surfaces of cylinders are proportioned to their diameters, while their capacities are proportioned to the *squares of the diameters*. Thus, if we compare a six inch and a three inch pipe, their capacities are as 36 to 9; or the larger pipe has four times the capacity of the smaller, with only twice the surface.

* Let D be the diameter of the larger, and d that of the smaller cylinder. Then the corresponding circular sections will vary as D^2 to d^2; that is, putting C for the larger and c for the smaller cylinder,

$C : c :: D^2 : d^2 \therefore C-c : c :: D^2-d^2 : d^2$;
or $C-c \propto D^2-d^2$. Q. E. D.

* See, particularly, M. Marcus Bull's Experiments on Fuel, where the efficacy of this principle is fully exhibited.

† Seen at *a a*, in figure 2, which is a horizontal section of the radiator, near the top.

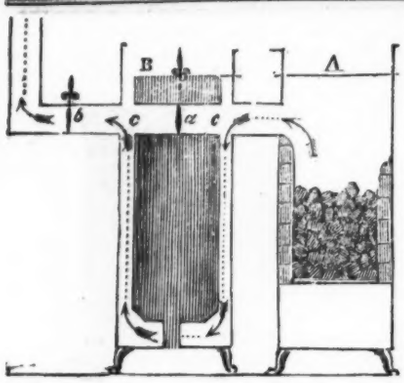


Figure 3 repreents a vertical section of the "Hall Stoves." The structure is composed of polished Russia sheet iron, and consists of two parts, the *furnace* A, and the *radiator* B. The furnace is lined with fire brick, and all the other parts of the entire structure which are exposed to the action of the heated gases, are protected by a wash which hardens by heat, and at once defends the iron from burning out, and prevents its being corroded by the acid fumes that are produced in the combustion of anthracite coal. For the ease of kindling, and to prevent smoke and gas, a pipe, open at both ends, is let through the miner cylinder, as represented at *c c*, forming a direct communication from the furnace to the smoke-pipe. As soon as the fire is well kindled, this pipe is closed by the damper *a*, when the current immediately takes the circuitous route indicated by the arrows. A copious radiation of heat from the whole external surfaces of the stove, with the addition of a constant current of hot air rising from the top of the radiator, diffuses warmth rapidly, and in a few minutes brings the room to the required temperature. When the fire is too intense, the damper *b*, which closes half the capacity of the pipe, is turned, and the fire continues to burn uniformly, demanding very little attention for many hours.

A singular *softness and purity of air* has been found to attend the use of this stove. This desirable quality has been secured by the following means. First, care has been taken not to suffer any part of the apparatus to become so hot as to contaminate the air of the apartment, by scorching the particles of animal or vegetable matter, that are always in greater or less amount floating in a family room. The furnace is lined with non-conductors, which do not permit the metallic surface to approach a red heat; and as soon as the heated current issues from the furnace, instead of traversing as usual, a narrow pipe, which in the parts nearest the furnace becomes excessively heated, the current on entering the radiator instantly expands over the extensive surfaces of the two cylinders, in contact with which, both within and without, the coldest air of the apartment is continually and freely circulating. Secondly, the *circulation* which is given to the air of the room by causing it to flow in at the bottom of the radiator, and, becoming rarified by heat, to flow out at the top, thus continually disturbing the equilibrium of the atmosphere of the room, has a signal effect in maintaining uniformity of temperature, and preserving the purity of the air. Finally, distributing the heat at the bottom of the apartment instead of the top, as is the case when given out from a common smoke pipe, contributes also a large share towards creating an equality of temperature above and below, securing warmth to the floor, and consequently to the feet, while the head is relieved from that oppressive sensation, which is experienced by many persons in a room whose temperature, near the ceiling, is a number of degrees higher than at the floor.

The testimony of two eminent physicians, of the cities of New-York and Brooklyn, attest the suitableness of this apparatus for the apartments even of invalids.

From JOHN NEILSON, M. D., of the city of of New-York, dated June 1st, 1836.

"Olmsted's Stove appears to me the very best contrivance to promote comfort and health, during our severely cold winters.—I have made use of two of these during the last winter,—one in our bed room, the other in the dining room,—with the most perfect satisfaction to the family. The warmth is uniform, comfortable, and not at all oppressive; and what is very desirable, furnished at a very small expense of fuel. The heat being diffused from a large surface, moderately heated, is preferable to that from a more limited surface intensely heated. The material, too, of which the stove is constructed, appears to give out a soft and pure air, and its circulation through the apartments is uniform as well as comfortable. Also, the method of regulating the heat by means of valves or dampers, is a very valuable improvement."

From ALFRED C. POST, M. D., of the city of Brooklyn, dated June 3d, 1836, (addressed to the patentee.)*

"It gives me pleasure to be able to speak of your invention in terms of strong commendation. Your stove appears to me to combine in a greater degree than any other with which I am acquainted the following desirable qualities, viz; ornamental appearance, cleanliness, easy management, economy in the use of fuel, and salubrity. With regard to the first of these qualities, the beautiful material of which your stoves are constructed, and the simple and elegant form which you have given them, seem to place them in advance of any other stoves which I have seen. When they are well managed, they are very cleanly, scarcely allowing any dust or ashes to escape into the room. It is very easy to kindle the fire, either with hard wood or with charcoal; and, by a little attention to the valves and doors, the heat may be regulated to almost any extent. The quantity of fuel which they consume is very moderate, in proportion to the amount of heat given off.—The last and most important advantage is, that they favor a *pure and wholesome state of the air in the room where they are placed.* By exposing a large extent of surface, they secure a sufficient amount of heat, without being intensely heated at any one point; and they thus avoid the unpleasant effects which result from the concentration of heat, which vitiates the air by the combustion of particles of animal and vegetable matter floating in the room, and probably also by the decomposition of the water, which is combined with the air, liberating hydrogen gas.

I think it, however, important to the salubrity of your stoves, as well as to that of all others in use, that water should be evaporated upod them."†

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*Dr. POST used two stoves during the season, a large Hall, and a Parlor Stove.

†The authority of Doctor POST on this point is entitled to the greatest consideration, although, on account of the great UNIFORMITY of temperature afforded by these stoves, most who have used them, have thought an evaporating dish unnecessary, unless the heat is raised above 70 degrees.

Although the radiator of this stove may be attached to a furnace of any construction, yet the best kind of furnace, and that usually employed, is one of polished sheet iron lined with fine brick. The less the portion of heat distributed from the furnace itself, the better. The smooth surface of sheet iron, and the non-conducting power of fire brick, unite to confine the heat of the furnace. By this means, the coal being kept from cooling, burns with increased intensity; and the air of the room is preserved from that contamination which results when the furnace is heated too hot. But if the heat is not distributed from the furnace itself, the apparatus employed for this purpose must have the requisite efficacy, or an unnecessary portion of the heat will escape into the chimney. A long pipe suggests itself as the first expedient. But this is attended with various disadvantages. It is expensive, unsightly, and cumbrous; and, as usually constructed, it gives out the heat in the upper parts of the room, while it ought to be distributed as near the floor as possible. For all these evils, the Radiator of Olmsted's stove furnishes an adequate remedy. In proof of this may be offered the following certificate of *Professor Andrews* of Boston, a gentleman who has paid much attention both to the philosophical principles, and to the practical management of heat.

From PROFESSOR E. A. ANDREWS, of Boston, dated June 6, 1836.

"Having made use of Olmsted's Stove during the whole of the past season, it gives me sincere pleasure to state the result of my experience respecting it. Its advantages may be comprised, I think, under the following heads:

1. It is so constructed that, by means of its peculiar *Radiators*, all the heat not absolutely necessary to produce a draught through the funnel of the chimney, is made available in warming the room. In *economy of fuel*, therefore, no other stove is likely to surpass it.

2. As this advantage is gained without the use of a pipe, which is always an inconvenient and unsightly appendage to a stove, the two requisites of *elegance and cheapness* are happily united.

3. As the stove and its radiators occupy the lower part of the room, the cold air, which is always near the floor, soon becomes heated, and mingling with that above, produces *a uniform temperature* through the apartment.

4. Such is the peculiar construction of the whole apparatus, that no part of it ever becomes excessively heated; and *the air of the room, consequently, remains remarkably pure.*

5. *The heat can be more perfectly regulated* in this than in any other stove I have ever seen; and whether the temperature of the room requires to be raised five or fifty degrees, it may be done with equal ease and certainty, and maintained uniform for any length of time.

6. The construction and management of the fire in this stove is peculiarly easy; and if properly managed, *no dust can ever escape from it* into the room.

On the whole, then, I prefer this stove to any which I have ever used, or whose operation I have ever witnessed."

We have received the Edinburgh Quarterly Journal of Agriculture for June, from which we make copious extracts.

HORTICULTURE—COMMON CABBAGE, EARLY YORK CABBAGE, LONDON NEW YORK CABBAGE, SAVOY, BROCCOLI, AND EARLY WHITE WARWICK PEA.

By Mr. Towers, Author of the Domestic Gardener's Manual, &c. C. M. H. S.

The *Brassica*, or cabbage tribe, presents us with the most important crops of the season, I mean the period included between the first of June and the two succeeding months. It is proposed to select three of the numerous species, namely, 1st, Common round-headed or hearting *Cabbage*,—2d, The *Savoy*,—3d, *Broccoli*.

1. The Common Culinary Cabbage, *Brassica oleracea*, Sect. 4. of Decandolle, No. 4. *elliptica*, the early York and particularly that fine improved variety, now called London *new* York Cabbage. All the members of the tribe belong to one family or genus, termed *Brassica:* they are found in the natural order *Cruciferæ*, the leading characters of which are four opposite petals, ranged in the order of a cross; there are four petals or calyx-leaves, six stamens, two of which are rather shorter than the other four, and this latter circumstance gave rise to the name selected by Linnæus to designate the members of his 15th class *Tetradynamia*, a compound Greek word, which indicates the power or *supremacy* of *four* out of six fertilizing organs. It may be of some importance to the farmer and cottager to be informed that, among all the plants of this class or natural order, not one perhaps is possessed of any really deleterious property. Among nearly one thousand species, as Dr. Lindley observes, "scattered over the face of the world, all are harmless, and many highly useful."

The varieties of the cabbage are numerous, but he *who possesses* the best early York, has that which combines most of the valuable qualities of that excellent vegetable,—compactness of heart, firmness, sweet flavor, and convenient size and form; it is also hardy, of very ready culture, and occupies but little space. I do not recommend it merely as a *culinary* vegetable; it might, and I think should, be made to rotate with the crops of the farm. It is not my desire now to digress, but I hope on a future occasion to adduce facts which will go far to prove that every farm throughout the kingdom would be improved, and the agriculturist proportionably benefited, by a greatly enlarged rotation. The land has powers and capabilities to double its productive return: We southerns are much indebted to our northern brethren for the lessons of wisdom which their refined system of agriculture has already taught us, but these cultivators, skilful and persevering as they have effectually proved themselves to be, may still advance; and with this conviction before me, I hope I may not be deemed presuming, if, at the earliest opportunity, I venture to attempt to fulfil the intention which I have alluded to above, and for which I am collecting the requisite documents.

The *soil* for cabbage should be a sound mellow loam, of a quality usually termed *fat*, or unctuous, wherein the *silex*, which forms its chief constituent, is in a state of extremely minute division, and united to a greater proportion of argillaceos earth (*alumine*,) than most common, gritty soils are; but the chief deisderatum of an unctuous loam is the impalpable state of the silex; for I have analyzed one of the finest loams I ever saw, without being able to detect in it more thau five or six per cent. of clayey substances, and scarcely a grain of chalk. But the cabbage will do well in most soils, provided it be exposed to the full influence of light and air, and be not shaded or stifled by trees, shrubs, or buildings.

Seed.—This will retain its vegetative power for three or more years, but it is always better to employ that produced in the preceding season, or if two or three year old seed be used, it should be tried in heat, sown in a flower-pot: a serious loss of time may be occasioned by a failure of the seed-bed. An ounce of seed will suffice to sow forty square feet, if scattered broadcast, but less will be required, if it be sown in drills, six or seven inches asunder; and this method is always advantageous, because the Dutch or thrust-hoe can, at any time, be passed easily between the rows. If cabbage be cultivated in *the field*, it is calculated that half a pound of seed will afford more plants than will grow on an acre; and it is stated, in recommendation of the vegetable for the purposes of the farm, that if the cabbages be cut, freed from bad leaves, and carried to the cow-yard, "they are more beneficial than hay, given in any proportion, when only combined with straw."

"In the *fattening* of neat cattle, an acre of good cabbages may be nearly sufficient for three beasts of from forty to fifty stones each, which have been grazed in the pasture during the summer. A middle-sized bullock, in general, consumes about 100 lb. in twelve hours."* "Half an acre will be nearly sufficient for 100 sheep, when the crop is good: a sheep consumes nearly 10 or 12 lb. in twelve hours."—(*Baxter's Agric.*) I have repeatedly tried cabbage in cow feeding, and on every account recommend the substitution of *York cabbages* for the coarser and more bulky varieties.

In *garden-culture*, we have to consider the object of the cultivator; if spring or early summer cabbage only be required, one sowing of a single long row or a small bed will suffice. In the southern or middle counties of England, it is usual to limit the period of sowing between the 6th and the 12th days of August; but in the north, I presume that the third or fourth week of July should be chosen. Experence has proved that seed sown early in July, will produce plants which are liable to run to seed in the following spring; while, on the contrary, the plants of late sowings rarely acquire strength sufficient to resist the rigors of the winter. *The soil for a seed-bed* ough to be lighter than that used during the future growth of the *plants;* it should be moved to the depth of a few inches, and made very fine: then, the line being strained tight, the first drill is to be cut by drawing the angle of a the in hee direction of the line, with its edge resting against it. An inch or less in depth is sufficien; but, as all seeds rise better if they rest upon a true surface, and be closely embraced by the mould, it will be proper to level and compress the bottom of the little drill by patting it with the back of a wooden, round-headed rake, or by placing a long pole, like the handle of a rake, into it, so as to form a sort of groove. In this, the seeds are to be scattered as regularly as possible, after which it would be as well to dust them over regularly with a powder composed of two parts (say *pounds*) of powdered quick-lime, one part of coal-soot, and one sixteenth part (one ounce) of flour of sulphur. This mixture is inimical to insects, and does not injure the young plants. The groove is next to be filled up with fine earth, which is to be made firm and even, by pressing it down with the flat of the spade. In like manner, all the other drills may be made and finished. If the weather be showery, and the ground in a moist state, but still free and open to work, nothing more need be done. It sometimes happens, however, —as was the case to a very injurious extent throughout the summer of 1835,—that the soil is found dry even to dustiness. In that case, as it will not answer to let the critical period pass over, the intended bed sholud be watered copiously for three successive nights, till it become completely moist, and a mat or two must be thrown over it during the intervening days. Seeds sown in soil thus prepared, will vegetate very rapidly; for warmth and moisture are the prime actuating agents of vegetative life, as direct *solar* light is that of maturation. Waterings, or rather the ordinary sprinklings, so termed, will prove of no avail, if the seeds have been sown in arid soil, as was fatally proved last year. In hot sunshine, the mat ought to be used till the seeds vegetate. *The seedling plants* will be liable to the attacks of slugs and other enemies; to guard against which, they may be sprinkled with a little of the powder mentioned above; or the spaces of soil between the rows may be covered with dry saw-dust or chaff; but thick sowing is perhaps the most effectual means to secure a sufficient supply, and it is always prudent to practise it, because many seeds are inert; and it is better to displace the supernumeraries by timely thinning, than to have a paucity of plants, nine-tenths of which may perish by accidents. When the first true leaves appear, and acquire a little strength, much of the danger will be past, and the plants ought to be thinned out, so as to stand an inch asunder. Again, as they advance in growth, they ought to be reduced in number till double that space intervene between plant and plant.

*There must surely be some error in this statement, of an acre of cabbage being able to fatten nearly three beasts of from 40 to 50 stones each: 100 lb. of cabbage in twelve hours, that is the average number of hours of day-light in each day, for twemy weeks from the end of October, will amount only to 6 tons 5 cwt. Now a middle-sized ox will, in that time, consume 30 tons of Swedish turnips. Do 6 tons 5 cwt of cabbage yield as much nutriment as 30 tons of Swedish turnip?—Ed

TRANSPLANTING.—Some gardeners have attempted to obviate this operation; but the roots first produced are few in number, though strong, and of considerable length: the plants also acquire a tall and shanky growth; and above all, it is evident that, if cabbage plants be made to perfect their growth on the site where the seeds were sown, the allotted space must be very great, because they *must* be thinned out so as finally to stand one foot asunder at the least. Transplanting, therefore, should be practised, and that, too, as soon as the young plants have become three or four inches high, and begin to crowd each other. The operation effects two or three good objects. It causes the roots to produce a number of short fibres, or, as it is termed, to become "stocky:" it dwarfs the plants, and, while making them strong and compact, secures them to the soil; and it enables the grower to protect those left in the seed-bed (as some always should be) by coverings of mats thrown over arches, formed of hoops or pliable rods, in the event of very severe weather.

In transplanting, let the bed or plot be a good firm loam, if possible, pretty well manured, thoroughly digged, and in a free, open situation. Select strong plants of nearly equal growth, and insert them in rows by means of a dibble or trowel, fixing each firmly in the soil, eighteen inches apart *every way*, if the variety be a free grower; but the small Yorks will do very well if the rows be that distance apart, the plants standing only twelve inches asunder in the lines or ranks. It is indispensable that the soil be brought closely to the roots, and made to press them firmly in every part; and should the weather be dry, much time will be gained by making the holes so deep as to receive the plant to the full length of the stem of each, and filling every hole brimful of soft water: then, by pressing the soil laterally and on every side with the tool, the roots will become puddled in, and secured at once. The period for the work must depend upon the growth in the seed bed; and if the season be early, and the weather warm and showery, the transplanted cabbages may grow so rapidly as to require the check of a second removal, or at least to be raised up and re-set; but in general, and under ordinary circumstances, it will be sufficient to leave them undisturbed, as then the crop will be ready for culture at a more early period of the spring. In the south, it is no uncommon circumstance to cut fine-hearted cabbages in April, and very good ones in May. In the north, the growth must be more tardy in most situations.

The *seed-bed* will require care and attention. I have said that some plants ought to be left in it; and I urge the practice, because, in severe winters, the entire crop is sometimes cut off. The seedlings remaining ought, however, to be raised up; the longest roots cut back nearly one-third, and the plants be re-set in regular order and distances. Thus, supposing that 200 plants remain in it, and be made to stand four inches apart in rows which are six inches asunder, a bed little more than twelve feet long and about three feet wide, including its edges, will contain this valuable stock, which in severe weather could be covered by by three or four garden mats, and thus secure a pretty ample supply of plants for the spring. Another precaution may always be resorted to. In transplanting, deep drills or grooves can be formed by the hoe or spade, and along these the plants may be set so deep, that the lowest leaves may stand just above the soil. I adopted a still more efficient plant of security last October, though I do not recommend it because I think the growth in the early spring months is thereby retarded. Having a piece of ground set up in ridges, nine inches high, and the time pressing, I planted my young cabbages in the bottom of the trenches between the ridges. On three occasions the thermometer fell twenty-two degrees below the freezing point, and not a plant has been touched, though no covering was applied at any period of the winter.—My broccoli, also, has stood in perfect security, in consequence of the stems being lower than the level of the edges of trenches made expressly for them. However, as cabbages ought to be hoed freely in the autumn, and the spaces between the rows digged once or twice, as soon as the plants resume growth in the early spring, it is evident that the ridges present an obstacle to these important operations. If the winter prove mild, the cabbages will progress in some degree; but if by cold they be rendered torpid, they will start into growth with the early return of solar influence: a few may fly up to seed, but the greater part will form hearts, and can be cut in succession. In cutting, it will be prudent never to take off the green and healthy leaves. those that are inert and yellow, will scale off of themselves, or with the slightest effort: but the green and firm ones have still an important office to perform, in petfecting the axillary buds which produce young sprouts. These secondary cabbages, or "greens," affect an open growth, and in themselves furnish a delicious vegetable, but they may—that is a portion of the best formed among them—be devoted to another purpose of considerable utility in garden economy. The shoots when about five or six inches long, are to be gently twisted off from the stem, and the lacerated heel of each being trimmed perfectly even and smooth with a very sharp knife, but not shortened; the young plant thus rendered a cutting is to be very carefully planted in lightish, sandy, fresh moved loam, so deeply as nearly, but not quite, to include the entire stem. The setting-stick or dibble is to be thrust diagonally into the ground in three or four places, in the direction of the heel, so as to fix it firmly in the soil, and then a little water should be given to each plant to wash the earth closely about the stem. Detached shoots so treated, will frequently produce roots speedily, and bring a supply of excellent secondary cabbages, true to the original varieties: *seeds* are apt to sprout, owing to cross impregnations.

To sum up the chief points of cabbage-culture for spring and summer main crops, it must be observed that the *period of sowing* should be strictly attended to: the *seed beds* are to be slightly hoed to keep the ranks clear of weeds; the stronger plants are to be timely removed to the final beds, wherein two autumnal hoeings and a moderate earthing up must be given during the progress of growth. On the approach of spring, the intermediate spaces are to be digged or forked, after the removal of the inert leaves, and the operation should be repeated when the plants evince the tendency to fold up their inner leaves for hearting.—By a careful attention to these needful processes, a bed of fine cabbages will, in favorable seasons, be secured. Having thus dwelt so minutely upon the routine culture of the cabbage for the main spring and summer supply, I shall only allude to that part of the treatment of succession crops, which refers to the summer and autumnal months.

It is usual to give directions for sowing the seed at several distant periods; but my object is to obviate trouble, and to simplify operations as much as possible; and as I have proved that, by attentive management, a regular supply of fine plants may be obtained from one extra sowing, I shall presume that an extensive seed-bed or plot exists, having been prepared late in March or early in April. The mode of culture will be understood by the directions already given: what, therefore, remains to be said, will apply to the order of routine which ought to be observed subsequent to the *first of June*. At that time, we may suppose that the greater part of the cabbages have been cut, the stems remaining being left for the production of sprouts. The seedlings of the April bed that are in a state to be transplanted, should be carefully selected, and set in a bed of rich soil, watered, and attended to in every respect as were those of the spring crop. This first bed, with the cuttings of the sprouts and the other shoots yielded by the old stems, will produce an ample supply of a second crop during July and August.

After the removal of the seedling plants, those which remain in the seed-bed should be gently lifted and replaced, but at regular distances three or four inches apart; the ground should be moved, cleared of weeds, made level, and well watered if the soil be in a dry state. Should the plants be very numerous, a hundred or two of the best might with great advantage, be moved to a succession bed to stand in rows, six inches apart, plant from plant. Thus they will acquire stocky roots, and be checked for a time; while the seedlings will gain strength from the additional space afforded them.—If a bed be formed and planted for cabbaging in June, and thence every two months; and especially if—as I must presume—a previous transplantation had already been made during May, it is obvious that a succession of crops will be secured during every favorable season till the end of October; and I may add, from positive experience, that if the weather be then fine, and the succeeding winter prove open and mild ("a green yule"), any remaining stock in the seed-bed, however long-shanked and ungainly they may be, if set deep in the soil of a well prepared bed, may make good

Progress to the end of November, survive the winter, and produce excellently hearted and sweet-tasted cabbages in April. Small they will be, and some perhaps will fly to seed; but those which do succeed, will amply reward the attentive care of the grower. My experience applies, of course, to the latitude of London, though in a county far westward, and much later in its productions; but I presume that in the north also these hints may be rendered to a certain extent available.

2. The Savoy, Brassica oleracea bullata of De Candolle,—a variety distinguished from all other hearting cabbages by the puckerings of its leaves. It is one of the prime winter vegetables, and well merits the attention of every one who has a garden or kail-yard. There are three subvarieties—the large yellow, the green, and the smaller *green*, which is the hardiest of the three.

The savoy must be sown pretty early in the spring, and therefore I say nothing now of the early processes of its culture; but as it will require transplanting to plots where it is finally to remain, it will be needful to observe, that, as in all respects the intermediate culture will, as nearly as possible, resemble that of spring sown cabbage, the directions above given will apply to it. In England it is customary to transplant at two or three periods of July for the winter supply; but it will be proper to commence the work earlier in the north, and to finish by the middle of that month. The ground should be well digged and pulverized; the texture rather light, and the quality rich.—Draw drills or shallow trenches about thirty inches apart; tread along the drills or press them with a broad pole, till the soil become smooth and compact; then plant the savoys eighteen inches asunder, filling the holes with water, and fixing the roots firmly in the soil. After they have become established, and begin to grow, the spaces will require the hoeings and diggings which are so essential to the progress of plants of all the cabbage family, and have been before alluded to. As winter approaches, the earth ought to be brought up to and about the stems.

The planting in open, manured trenches, in *dry* weather will not only secure the growth of the plants, but greatly tend to protect them from frosts during winter.—*Savoys* are not considered to be in perfection, till they have been exposed to a degree of frost; and they will subsequently furnish the table throughout the winter months.

3. Broccoli.—This variety of the cabbage tribe is divided into a number of subvarieties, all of which are excellent furniture for the garden. By Professor De Candolle it is placed in the sixth division of his arrangement, *Botrytis* (*Brassica botrytis*) *i. e.* resembling a bunch or cluster of grapes, but this grape-like species or variety admits of another sub-variety, as No 1 is the cauliflower, *Cauliflora*, or flowering cabbage; but No. 2 is the broccoli, and is designated as *Asparagoides*, or asparagus-like cabbage. Though the similitude of broccoli to asparagus may appear somewhat fanciful; yet as precision of classification is obtained, it will be perceived that it is far better to enter into minutiæ closely, than to persist in a mode of arrangement which is equally ill-defined and undiscriminating.

This delicious vegetable is perhaps without its rival in the garden, and its culture is very simple; it is too late, however, in the season to raise it from seed, and therefore I defer to enter upon a regular detail till the spring of next year. I have, however, raised some of the finest *Portsmouth* cream-colored, from seeds sown after the 10th of June, which produced compact and exceedingly large heads in the following April or May: it may therefore be worth while to try a small sowing as early as possible in June, following the directions, in as far as concerns the mode of preparing the soil, &c., which are given under the article cabbage, and transplanting into manured trenches, six inches deep, and ten or twelve inches wide, not later, if possible, than the third week of August. In the event of frosts, before November, no time should be lost to bring the earth that was thrown out, and lay as a ridge on each side of those trenches, to the stems of the plants, as is done in earthing celery.

But if we may trust some modern writers of new discoveries, *broccoli may* be propogated by slips, with the most successful results. Every one ought to try the method who has in his garden the stems of plants, the heads of which having been cut show a tendency to protrude sprouts. In *the middle of June*, says a writer, whose article is now before me, (or for Scotland, say *as early as possible in June*,) "I slipped off a quantity of the side shoots, and planted them. I had them well watered and well secured in the soil. They struck root in a very short time, and made strong plants which produced heads of a fine size at the usual season." "I am persuaded the plan is well deserving attention, not only with broccoli of the same kind I have cultivated (*late flowering purple*) but with many other kinds; thus an excellent variety might be perpetuated without the risk consequent upon seed."

I have not myself had an opportunity of experimenting upon this vegetable, since I saw the article quoted from, but have reason to believe the plan has been proved to be feasible; in fact, there is nothing in the analogy of the species with its type, which is unfavorable to the operation.

4. Pease.—At this season of the year it may appear almost too late to speak of the cultivation of the pea; but I am inclined to notice it for a reason which will be shortly explained.

The *garden-pea*, of which there are many varieties, is found in the fourth tribe, *Vicieæ* (that is among the vetches) of the great suborder Papilionaceæ of the natural order *Leguminosæ*, and in the 17th Class, 4th Order of the Linnean System, Diadelphia, *Decandria*. Every one is aware of the peculiar shape assumed by the blossoms of plants of the pea tribe; which, it is evident, can readily be made to constitute the type of a very natural class, in which most of our esteemed leguminous or pulse-bearing vegetables are to be found.

At some future day, I intend to enter at large upon the characters of all the favorite pease for table use; but on the present occasion I only allude to one, which is a great acquisition, and of very recent introduction, the early white *Warwick*. It is adapted to field, as well as garden culture, is moderately prolific, hardy, extremely early, rapid in its course of growth, soon off the ground; and of a high peculiar flavor, that to some persons is extremely agreeable, though others do not affect it.

The seed, two years since, was dear, its price is now reduced; and it is stated that three crops may be produced on the same land, and leave it open for wheat. This, however, I have not seen proved: but having grown the pea, I can recommend it to every one who wishes a rapid grower. A crop sown in a long drill very early in June, may be succeeded by another sown in July, with every prospect of success. If the ground be dry, from a continuance of hot weather, the best method to ensure a vigorous plant is to dig a moderately broad trench, to saturate the soil at the bottom with water, to return the earth into the trench, and make that very wet; then, after covering the earth with mats, or green boughs for a day, just to permit the earth to settle, and so far to drain itself as to become in a workable condition, to strike a drill three inches deep, to sow the seed along it pretty thickly, but not in the crowded state too frequently seen; water should then be poured from the spout of a pot over the pease, and the loose earth returned upon the seeds, and pressed or trodden firmly over them. One liberal preparatory watering thus given, is of more avail than fifty subsequent sprinklings. *Mildew* so common on the plant of autumnal crops, is, as Mr. Knight truly observes, obviated. He has had perfectly fine pease on his table in October, and it is certain that where disease can be prevented, pease in that season are a delicacy of the first-rate excellence. The Warwick, I think, promises to prove a valuable species for the purpose of a late crop, because the course of its entire culture is more rapid than that of the "frame" or early Charlton pea. When the plants rise above the soil one inch, the earth near the roots ought to be loosened by the thrust hoe. Another hoeing must be given when the plants are three inches high; and then, after drawing the lightened earth to the stems, to the height of an inch and a half, as a ridge on each side, branching sticks a yard high are to be applied. Nothing favors pea culture more than judicious sticking: the plants are brought to the light, are supported, and at the same time protected. *Mildew* is the bane of autumnal crops: it seems to be promoted by a droughty state of soil, high solar heat during the day, and cold dews at night: rapidity of growth produced by a deep moist bed, procured by preparatory and *profuse* waterings, appears to be the only effectual security from this fungus.

From the Quarterly Journal of Agriculture—for June,

ON PRESERVING POTATOES, AND RAISING THEM FROM SEED. BY SIR G. S. MAC KENZIE, BART.

The Highland Society, always anxious to procure information, has offered a premium for the best and approved account, founded on experience, of the most successful method of preserving potatoes in good condition, in their natural state, for a period of not less than ten months from the time of their being taken up. I hope to be able to give to the Society satisfactory information on the above subject, having paid long and particular attention to the potato, and to state some circumstances which do not appear to be so generally known as I presumed they were until I saw the offer above quoted.

Of various methods I have tried for preserving potatoes from frost, that practised most commonly seems to be the best, viz: Making a shallow pit about a foot and a half deep, on a dry spot, and heaping the potatoes like a roof to the height of about four feet. On the heap thus formed, straw is laid to the thickness of about eight inches, and over this the earth taken out of the pit, the whole being beaten firm by the back of a spade. Some time about the end of February, or beginning of March, the pit is opened and the potatoes turned over, all the shoots being picked off. I may here remark, that where a few side roots have proceeded from the shoots, I have planted them, and had almost as large a produce as from sets. The mode of planting them is to cut a drill with a spade so deep that the shoots may be covered about two inches. They are laid inclined upwards towards the soil, covered, and another drill made, and so on. The only risk is from frost; for if once nipt down, their shoots do not recover so readily as those from sets. On this subject I beg to add, that for early potatoes it has long been my practice to spread sets on the floor of a vinery, or on a hot bed in March, with a little sand over them. By the time there is little risk of frost, the shoots are long enough for the sets to be planted out about the middle of April. I have frequently had the shoots nipt down, but they always recovered; that is, new shoots sprung up in a very short time, and I never observed that this made any difference in the period of the tubers becoming fit for use. The early potatoes I use are the London early for the first crop; some of my own, which is a little later, and remarkably mealy for an early potato. After the heap is turned over, as I stated above, it may be again covered, and the potatoes allowed to remain a month longer, after which they should be removed to a barn or shed, and picked.—They should now be frequently turned over, and picked free of shoots. If the eyes of a potato are scooped out, it will gradually dry, if properly exposed; and it may then be scraped into flour though not very white. In this state they will keep for an indefinite time; and there is no risk of their becoming mity, as flour does, dried potatoes might be found useful during long voyages, though potato flour is better.

It ought to be made generally known that there are varieties of the potato which, though sufficiently protected from frost, will not keep, *under any management*, for more than a few months. Do what we will they decay, owing to their natural constitution; other varieties again will keep very long without any trouble. Hence the Society's proper object is not to offer a premium such as the one which has given occasion for the present communication, but to offer one for raising new varieties, and producing one or more with as many as possible of the qualities which a potato is desired to possess. The same observation applies to the keeping of apples and pears, and various fruits and roots. Long keeping is a particular property belonging only to some, and not to all varieties.

Some varieties of the potato are best for the table early in winter, and others are best in spring. Instead of having the trouble to raise different sorts for different seasons, it is best to sow seeds and to procure a number of varieties in this way for selection. It is now about twenty years since I first began to raise new varieties; and I will now state my mode of proceeding, that others may follow it if they think fit.

I first noted down the qualities which it was desirable a potato should have. These are, 1, dryness or mealiness; 2, agreeable taste; 3, moderate size; 4, regularity of shape, not having deep eyes; 5, not bursting when boiled; 6, not having a tendency to shoot at an early period; 7, long keeping; 8, productiveness. Among hundreds of varieties I have not found one possessing *all* of these qualities, but I do not despair.

Having gathered the apples from different varieties, I keep them till spring, when I open them, take out the seeds, and dry them. A piece of ground being prepared by digging in some manure, but sparingly, and the surface being finely raked, the seeds are dropped thinly into shallow drills, two feet asunder. When the plants appear, they are thined out to eighteen inches in the rows, and I have usually selected the strongest. Those taken out may be transplanted to another spot. As the plants grow, the earth is heaped round them, I have observed that, with some exceptions, those plants which flower the same season, seldom produce tubers. My experience has proved that the produce of the first season is not to be relied on as an indication of future productiveness; therefore no seedling should be rejected the first year. I recollect a plant that produced but one tuber, about the size of a walnut; this produced the second year one hundred and twenty tubers of good size; but this degree of productiveness did not attend succeeding generations. I have observed in general, that rough or scaly skinned potatoes are the driest, and often too the earliest. I plant every tuber produced the first season that is not less than a pea, for should one hit on a good variety, it is then more rapidly increased; it is but a lottery, and some space of ground must be allotted to the drawing of it. I have had as many as three hundred varieties growing at once.—Of course, each variety must be tallied, and a memorandum kept of every thing connected with each. Each variety should be tested the second year, at the time it is taken up, and again in the spring, and those that are good at both seasons preferred for future trial. Indeed all may be rejected but the one that has the greatest number of the qualities noted. In this way every one may procure sooner or later, a good variety of potato. It is of the greater importance to procure in this way; for difference of soil, and even perhaps of situation, seems to have singular effects, a fine potato in one soil proving bad in another, and *vice versa*. I have one variety that possesses the 1st, 2d, 4th, 5th, 6th, and 7th qualities, which I have cultivated for about eighteen years, and I have not yet succeeded in raising a better. It seldom, however, yields above twenty bolls an acre, of old Ross-shire measure, the peck being fifty-six pounds. Though there are many sorts more productive, yet this potato keeping very long under the management already described, has brought it into very general use in this quarter. I have had young potatoes of this sort, of tolerable size, at my table along with tubers of the previous year. It is ripe by the middle of September. During the two last seasons, the sets of potatoes decayed in many places. None of my own were affected, but some of my tenants lost large patches. I observed a wire-worm on some of the decayed sets, but whether this worm was the cause of the failure, or the failure of the sets induced the insect, from whose eggs the worm proceeded, to lay them on the set, I could not ascertain. It often happens that effects are regarded as cause in such matters. It is my practice to have the potatoes cut into sets, and spread out to dry during ten days or a fortnight before planting them. This serves to prevent risk of their rotting in the ground. But I have known sets of some varieties rot soon after the appearance of the plant above ground; and others I have taken up sound when the crop was ripe. Thus it is clear that long keeping does not depend on the *mode* employed to preserve potatoes, but on the natural quality of a variety; and the varieties ought to be increased from seeds until the qualities I have enumerated are found in one, or at least the most important of them. It is the opinion of some that the productiveness of potatoes decreases by long cultivation. I doubt this, at least it has not occurred to my observation. If a variety be planted on a soil different from that in which it has succeeded, it may fail, and I have known this to happen.

On the whole, I conceive that the object of the Society can be best attained by the recommendation to every one interested in the culture of potatoes, to raise new varieties from seeds. Seedlings rejected, I mean the second year's produce, need not be thrown away, but given to cattle or pigs, so that the space occupied by the plants cannot be said to have been misapplied.

Since the above notices were written, extensive and accurate experiments have been made in the garden of the London Horticultural Society, in reference to the question, whether it is best to plant sets or

whole potatoes. I had long since found that sets were best. The first set of experiments made seemed, however, in favor of whole potatoes; but I pressed a repetition, and also repeated the experiments myself, and the question has now been finally decided in favor of sets. It might perhaps be of use that a well prepared abstract of the papers in the Horticultural Transactions should be drawn out for the *Quarterly Journal.** A great deal of nonsense has been published about the remarkable failures of the potato crop in different places. The thing is still a mystery, which may not be cleared up for some time. It appears that early planting gives heavier crops than late planting.

From the Quarterly Journal of Agriculture—for June.

ACCOUNT OF THE MODE OF PLANTING PRACTISED ON THE PROPERTY OF THE MERCHANT MAIDEN HOSPITAL OF EDINBURGH, IN THE NORTH EAST COAST OF SCOTLAND. BY MR. RODERICK GRAY, PETERHEAD. COMMUNICATED BY ROBERT JOHNSTON, ESQ. EDINBURGH.

It is evident that, in former times, a great extent of Buchan had been covered with wood—the remains of which are found in great abundance in the extensive mosses in that district. Remains of the following species most prevail, oak, elm, birch, alder, and hazel; no fir being found in these bogs.

About ten miles from the coast, wood, to a moderate extent, has been reared, perhaps past the memory of man; and, within the last thirty years, small clumps have been planted nearer to the sea with considerable success, although the progress they make is very slow.

Along the east coast of Buchan, especially that part of it which lies flat and very little elevated above the level of the sea, and projecting into the German Ocean, it has been generally supposed that wood cannot be reared with success. Many attempts have been made, which have ended in disappointment. More success now attends such experiments.

These appear to be the causes which operate against plantations on this coast. Exposure to the east and north-easterly blasts—the little elevation above the level of the sea, the saline particles of which are carried to a considerable distance, and rest upon and destroy the tender leaves of the young wood—in many situations the ferruginous incrustation between the soil and subsoil, provincially called *pan*, varying in thickness from an eighth part of an inch to six inches, and, in some cases, to more than a foot, renders the roots of young trees sickly, which have not sufficient vigor to penetrate into the subsoil, which supplies their permanent nourishment—before draining was carried to its present extent young trees were injured by the mildews arising from bogs.

The following expedients appear calculated to render less formidable the above causes, which operate against the rearing of plantations. 1st, To protect the plantations from the sea-blast by rearing a thickly planted belt of such trees and shrubs as are least liable to be injured by it,—such as willow, broom, furze, elder, sea-buckthorn, thorns, &c. 2d, To plant thick and to considerable extent, so as one part of the plantation may afford shelter to the other, and not to prune too early or too severely. 3d, To break the ferruginous *pan* by the trench-plough, when not attended with too great expense. 4th, To fill up the plantation yearly during the first seven years with new plants where the old have failed.

In the year 1830, the Governors of the Merchant Maiden Hospital of Edinburgh gave instructions for planting around the Castle of Ravenscraig and on the banks of the Ugie. The plantations consist of Scots fir, larch, ash, birch, sycamore, mountain-ash, elm, beech, and alder; all of which appear in a thriving state, and, having been planted chiefly from the seed-bed, have made as much progress as could have reasonably been anticipated.

At the same time, the Governors gave instructions for planting about fifty acres of the hills of Auchtigall and Collielaw.—These hills are of poor moorish soil, consisting of dead moss, gravel, and flint, resting on *pan*, and covered with heath and moss. The subsoil is composed of gravel, intermixed with clay. The ground was enclosed with earth-dyke and ditch, sown on the top with furze, which has thriven well. The trees planted were chiefly Scots fir, larch, and spruce, with a small mixture of ash, birch, beech, alder, and oak. They were planted from the seed-bed with the diamond, dibble, at three feet apart. The plantation has been thrice filled up with young plants. The firs have succeeded as yet very well. The ash and beech have failed the most. The alder, birch, and oak, especially the birch, look healthy where the roots have reached the subsoil. The beech appears to thrive where the ground had been previously prepared by breaking the *pan*. Transplanted trees did not succeed so well as the seedlings, in consequence, perhaps, of being brought from a rich to a poor soil.

If the plantation on these hills shall ultimately succeed, which its present appearance gives reason to expect, there can then remain no doubt that many parts of Buchan may be planted with great benefit to the adjoining lands,—affording shelter—meliorating the climate, and beautifying a district excelling in grain, grass, and cattle, but wanting woodland.

There is no doubt that if, instead of the diamond-dibble, the common spade were used in slit-planting, and the mattock also taken to break the *pan* below the slit, larger plants might be planted with certainty of taking root. I have observed that, however careful the planters were in planting with the diamond-dibble, many plants never took root in the soil, owing either to their not having been put deep enough into it, of the roots having been doubled up introducing them into the ground, the root as well as the top of the plant become thus exposed to the action of the atmosphere. The expense of using the mattock is from 15s. to 20s. per acre. For this reason, I made an arrangement for filling up the plantations with the spade by slit-spliting, under the immediate inspection of the Hospital's hedger, Thomas Donaldson. In this way, 114,500 plants have been put into the ground, being rather more than 2800 to the Scots acre,—consisting of Scots fir, spruce, alder, and birch, part of which were seedlings, and part one, two, and three years transplanted. The ground is now very closely planted, and I do not anticipate that it will require again to be filled up except in very particular situations.

The progress made by the young trees last summer was on the whole satisfactory. Some of them attained inches—some from an inch to a foot, while others merely kept alive. This, I believe, is what takes place in plantations in moor ground in most situations. It would be impossible for me to form a decided opinion of the ultimate result, but, in the mean time, it is cheering to observe that the plantations are equal to others of the same age in more favorable soil and climate. I had formed an opinion that, before planting, it would have been of use to have burnt the dead moss and heath. The planter was of a different opinion, and thought that the heath and moss hillocks would afford shelter to the young plants and certainly where the plants have derived shelter from the heath or hillocks of moss, they have thriven better than where exposed. But where the moss and heath had been accidentally burnt, the young wood has made much greater progress than any where else. I have this spring (1836) trench-ploughed, fallowed, dunged, limed, and planted a belt at the Blackhill, chiefly with the different varieties of hard wood trees, of as many sorts as I could easily get, in order to answer the descriptions best calculated to thrive in the soil and situation.

Peterhead, 25th April, 1836.

From the Quarterly Journal of Agriculture—for June

QUARTERLY AGRICULTURAL REPORT.

June 1836.

If the winter quarter was remarkable for variety, the spring one has been no less so for uniformity of cold and chilly weather, arising, in great measure, no doubt, from the continued influence on the air of the great quantity of snow which had fallen among the mountains, a quantity only exceeded by the fall of 1823. The chilling air has, in consequence, much retarded vegetation. Indeed, it has been asserted, that field operations have not been so backward in any spring since 1817; but there is no need of taking so distant a retrospective view as 1817 for a late spring, for in 1823 the snow had to be ploughed around the margin of fields in the middle of April, to permit the ploughing of lea. The heavy fall of snow in the mountains has caused the destruction of many thousands of sheep. It is stated that one-fifth of lambs and one-fourth of ewes and hogs of some large flocks have perished. Such a fearful statement excites the most serious apprehensions of the propriety of the present winter management of mountain flocks.—Some years ago it was a customary prac-

*Such an abstract as is here alluded to could not be more acceptable to the Quarterly Journal than from the experienced pen of Sir George Mackenzie.—Ed.

tice in winter to bring sheep from the mountains to rough pastures in the lowlands. The practice imposed much travel on the sheep, and, owing to the mild winters for years past, it has been relinquished. But when the objectionable practice was abandoned, provision should have been made for the safety of the flock in the recurrence of severe winters. Now, the use of bone-dust in raising turnips presents, we conceive, a ready help in time of need.—There is not a store farm which presents not a favorable spot whereon turnips might be easily raised; and were a two-course rotation of turnip and a white crop to be regularly practised on such a farm, a large breadth of turnips might be obtained every year on a limited extent of ground. Such a rotation of cropping would be quite legitimate on the arable portion of a store farm, for there the white crop would never require to be sown down with grass, the natural grasses amply supplying all the requisite hay. A ring fence of whin would protect the turnip, corn, and hay from depredation by cattle and sheep On the 9th May the sky cleared up, and the sun shone with power and splendor. His heat quickly melted the cerements of the leaf buds, and liberated into open day myriads of leaves to clothe the trees with every hue of delicate vernal green: realizing the descriptions given of the sudden but enchanting transition from winter to summer in Lapland. Ever since, to the last day of the month, the sun has run his daily course in a cloudless sky, and favored us with one of the most beautiful Mays ever enjoyed by husbandmen. The annular eclipse of the sun on the 15th, was there ore "very visible to be seen," as we heard a shepherd express himself. The effects of the said eclipse, we confess disappointed us. Philosophers foretold us that the sky would be so dark as to induce the cocks and hens to go to roost, and the birds to their nests,—as if fledged birds ever sleep in their nests—Now, we saw the swallows and the rooks soaring it aloft, and contemplated as little going to bed, as any biped on earth.

Rain was much wanted, particularly for the gardens, but as long as the decided cold easterly winds continued there was no rain, and but little dew, nor did any mist spread itself over the country from the sea. June brought rain, and for four days mildness and moisture promoted vegetation.—Since the 5th, the wind has veered to the north, accompanied with chilling cold, storminess, and the aurora borealis, not unlike June of last year. Without or with rain the hay crop must be short, the young grass being very backward, and although the grass was thickly planted in the winter, it now looks thin, and where obliged to be eaten, already appears as if burnt up with severe drought. This scorched appearance after being eaten, has probably been superinduced by dry frosty air at night, and hot sunshine through the day. The prospect of summer pasture is thus very discouraging. Good grass parks in favored situations have, in consequence, let at exhorbitantly high prices—as much as L.24 per Scotch acre. Young wheat looks pretty well upon kindly soils, but on clay lands which have become hard and crusty, it looks sickly, and is thin on the ground for want of tillering. Under any circumstances, we conceive, that wheat must now be deficient on clay lands. It is supposed that about one-fifth less is sown this season. It must, however, be held in remembrance that wheat has always a *sickly* appearance at this season, and that a short crop of good quality is better than a bulky one of inferior. Oats generally have received a favorable bed, but, as yet, do not bear a flattering aspect. Barley is now all sown On wet lands the sowing has been much delayed. Its braird promises much. Neither peas nor beans got a favorable bed, and, in consequence, are thin, and, in some places, even shy to look out of the ground.

The demand for all kinds of stock increases, and prices, as will be seen by the tables of butcher meat, have continued to advance since the date of last report. The exportation of live-stock and dead meat from Scotland to London, by steam, now constitutes a great trade. From Inverness, Aberdeen, Montrose, Dundee, Edinburgh, Leith, and Berwick-on-Tweed, steamers of large class ply, or are about to ply, to London with annual produce. In all probability, wool will again realize good prices, and if the great sacrifice of sheep in the hills is taken into consideration, we should anticipate extraordinary prices this season. At present there are strange fluctuations in the wool-market, occasioned, no doubt by speculators; but farmers should know their own interest better than to be deceived with such flimsey devices to entrap them to dispose of their wool at lower prices than they received in the last two years.

The Committee appointed by the House of Commons to inquire into the state of Agriculture, has already published two large volumes of evidence. What recommendations its report will contain, we cannot anticipate from the evidence. But we confess we have misgivings of any benefit which agriculture will derive from *this* committee, constituted, as it evidently was, with particular materials. In the time and manner of forming the committee, Ministers, very unhandsomely, in our opinion, gave the Marquis of Chandos the go-by. The Marquis was entitled to form the committee, which he early requested to inquire into the alleged distress of farmers, if granted at all, as he chose; his high character being at all times a sufficient guarantee to the country, that any committee formed by him would act fairly and honorably.

Among the expedients afloat for the relief of agriculturists, we observe the proffered assistance of a company to advance money to farmers on deposites of grain, the cash advanced being of course much below the value of the deposite This must be a species of pawning; and the lenders of money in this case, must have for their object the acquisition of large profits, like pawnbrokers in every other case. To raise money by pawn may suit the desperate circumstances of despairing men, but surely the condition of farmers is not yet so desperate as to drive them into so ignoble a barter. Will the exchange of valuable grain for less valuable cash amend the condition of the farmer? Will the grain deposited in another man's store at half its value, support the credit of the farmer in a higher degree than the same grain left on his own premises at its full value? Besides, how is the deposited grain to be afterwards identified on redemption? In truth, the scheme is so delusive in all its aspects, that we sincerely hope our agricultural friends will shun it as they should always shun the disreputable practice of pawning, although it should be presented to them in the most alluring form. A small cash-account, secured through the credit of a friend or friends, at a liberal bank established on the principles and conducted with the prudence of the Scottish Banking Companies, will relieve temporary embarrassments and afford a lasting source of replenishment.

A company for refining sugar from sugar-beet, holds out flattering allurements to farmers to grow the sugar-beet. There is no question that, were a steady market open for it, the cultivation of the sugar-beet would repay the farmer better than some of the crops which occupy his attention at present; but he would require, in the first instance, to be satisfied that such a market would likely become permanent, ere he would be induced to change the crops usually cultivated in rotation. Before such a company can survive, it must be able to present sugar of the same quality, and at not a higher price, than that obtained from our sugar colonies. The anticipation, that a company could supply beet-sugar on such terms certainly augurs very unfavorably of the productive powers of the West India Islands, after the expiry of the apprenticeship system in 1840.

Railroads every where pressed upon the landed interest as profitable speculations. Whether they shall be profitable speculations, depends on many circumstances with which the landed interest have no concern. That railroads in *all* circumstances must be beneficial to agriculture, admits of question. The present mania for their universal construction very much resembles the mania for mining gold and silver in America in 1825, only that the capital required for railroads must be spent within the country, and not thrown away among outlandish savages. This is a redeeming quality in the present mania for railroads.

After much opposition, Islington market for the sale of live-stock has been opened to the public. Breeders of live-stock are infinitely obliged to the public spirit and fortitude of its owner, Mr. Perkins, for having so patriotically risked a large capital in a doubtful struggle. He has now in a great measure, gained his point in the establishment of a market, and the number of stock is increasing in it daily; and although much opposition, arising from resentment, prejudice, and a sense of defeat, will yet have to be overcome, before Islington market shall present the interesting spectacle which it is capable of presenting—yet it is in the power of the owners of the stock themselves to overcome these obstacles by *simply studying their own interest.* It is without question, the interest of those who send live-stock to the London market, to

have them well-cared for before, at, and after the period of sale—cared for not only by ease and comfort in accommodation, but by refreshments continually at command.—Compare these circumstances as they exist in Smithfield with Islington. In the latter is every thing to render the situation comfortable to man and beast; in the former, every thing to render man and beast miserable It is in the power of every owner of stock who desires to send them to London market, to bestow those comforts on them, by simply directing his salesman to dispose of his stock at Islington market, and at Islington market only on pain of dismissal, and such a command will insure punctual obedience.

We recommend to the attention of literary agriculturists a pamphlet entitled, "The Future Prospects of the British People," by the author of that important statistical work, "The State of the Nation," in which many erroneous and vague opinions afloat at present on the condition of the farmer, are put right by reference to undoubted and recorded facts. Mr. Blacker's book on "The Claims of the Landed Interest to Legislative Protection," also deserves careful perusal by the landed proprietor and farmer. There is more sound political economy to be found in its few pages than in many volumes of delusive sophisms, with the high sounding titles of priciples of political economy, which have of late years been written more in support of certain preconceived theories, than the investigation of truth.

In Old Bell's Weekly Messenger of the 23d May, we observed the following paragraph: "In East Sussex some of the principal farmers on the 18th joined in a half crown annual subscription for purchasing '*The Quarterly Journal of Agriculture, and Prize Essays and Transactions of the Highland and Agricultural Society of Scotland*,' to be deposited at a circulating library in the town of Lewes, to be then delivered on the market days to the subscribers in the order of their subscriptions; and to the names of these farmers are added those of large landed proprietors and clergy, in hopes this inquiry into the plans which have caused agriculture so to flourish in North Britain, that the bleak north supplies a large proportion of the fatted meat now sold in London; and that agriculture in South Britain may rise from the depressed state which has made it petition for legislative relief." We trust the farmers of other counties in England will follow the good example thus set them by those of Sussex. In the preceding volumes of this Journal will be found practical essays illustrative of almost every subject of farm management, and figures of every improved implement of husbandry used in this country. In the Transactions are accounts of many improvements made by proprietors and farmers throughout the country, with the costs particularised. We do not assert that every practice in the husbandry of Scotland is applicable to the soil and climate of England; but it is evident that that practice which is safe in the poor soil and bad climate of Scotland, may confidently be pursued in the good land and much finer climate of England. Let the experiment of Scotch farming be *fairly* tried in England, in any of the southern or midland counties, and success will assuredly be the result. The ruling principles of Scotch farming, are economy and skill—skill in adapting the culture to the soil and situation, and economy in arriving at its completion with the least labor. What more is requisite "to make the wilderness to blossom as the rose?" The will. Book farming, we know, is not in favour with farmers, otherwise we should find admittance into *every* farmer's library, and every farmer has a library. But although we know, and therefore admit, that no man can be made a farmer by a book, we cannot admit that the best farmer may not at a time find useful hints in a book. The best farmer cannot know every article of practice which is followed in every part of the country, and as most practices are discovered by what is called chance or accident, it is clear that the discovery cannot generally be made known until it is disseminated abroad. A farmer who travels appreciates the information which he receives in conversations with farmers, and by observation of field-labor. Such a farmer possesses advantages over him who always remains at home, that is, within the circle of his markets. Now the object of an agricultural book, and particularly of an agricultural periodical work, is at stated times to carry hints, suggestions, and discoveries, important or unimportant, to the home of the farmer, that he who loves to stay at home may possess the advantages of him who travels at times abroad, and that he who travels abroad may compare what he has seen with what he reads, and decide what practice is the best suited to his particular purpose; or perhaps when comparing the hints of others, he may himself discover a practice superior to them all. In this manner a good agricultural periodical work is the means of disseminating through the country practices which would be confined to the district which gave them birth. Its principal aim should be to be a *good* work, that is replete with suggestions of good sense, and with confirmations of experience. The collection and presentation of these desiderata is attended with much trouble and expense, and unless the labor is appreciated and encouraged—and hitherto it has not been appreciated and encouraged as it ought—it is impossible to use means to collect the most valuable kind of information for prensentation.

RECLAIMING WASTE LANDS.

When we look about us in different parts of the State, we cannot help being struck with the amount of waste lands on every side. These appear in the shape of pastures grown up to bushes—in the form of swamps full of alders and birches, and in bog land which would bear excellent grass if the moss and the hardhacks were destroyed. Many, who undertake to redeem some their lands do it but partially, and as a consequence of not going thorough, have it to do over again every year or two.—For instance, we know a man who has mowed or cut down his alders four or five times, and they as often sprung up, and soon gave him another crop. A better way to manage this kind of growth is to pull them out by the roots, by means of ox labor. A chain put round them near the roots, and so fastened as to form a noose which will slip up when pulled upon, and a hand to bend the tops over the contrary way from which the oxen pull, will eject them root and branch. They will never start again. Another method is to have a large stout iron hook made for the purpose; an eye may be made at one end into which to fasten the chain. This may be hooked into the roots, and thus they may be *twitched* out with ease and despatch. A yoke of oxen and a couple of hands will clear up, and most effectually too, a goodly piece in a day. In regard to bogs—after they have been ditched in a proper manner so as to make them sufficiently dry—the application of fire in the spring, will in a few years effectually clear off such foul stuff as encumber them, and hinder the growth of better productions. In this way much of the waste lands which now disfigure the face of the State, and are comparatively useless, may be rendered smooth and profitable in a short space of time.—[Maine Farmer.

PLOUGHING BY STEAM.—The following is from a late English paper:—

"Some experiments were tried on Friday week at Red Moss, near Bolton, in this county, in the presence of Mr. Handley, M. P. Lincolnshire, Mr. Chapman, M. P. for Westmeath, Mr. Smith of Deanston, and other men interested in agriculture, with a complete and very powerful steam plough, constructed by Mr. Heathcorn, M. P. for Tiverton. About six acres of raw moss were turned up in a few hours, and turned up in a most extraordinary style; sods eighteen inches in breadth, and nine inches in thickness being cut from the furrow, and completely reversed in position, the upper surface of the sod being placed exactly where the surface had been before. The possibility of ploughing by steam has thus been established, though, as the employment of the steam-plough, in preference to one drawn by horses, will depend on the comparative cost of the two powers, and on that of the implements used, and as there are not at present any sufficient data for judging what the difference of the cost will be, it is not possible to say how far steam is likely to be applied to this department of agriculture. The plough of Mr. Heathcote, though a very powerful machine, appears to us to be much too complex and costly for common agricultural purposes, though we have little doubt that it might be used not only with effect, but advantage; in reclaiming large portions of moss land—such as the bogs of Ireland. Indeed, it is the opinion of Mr. Heathcote himself, that it would not at present answer to employ it in reclaiming a smaller portion of bog than 1500 or 2000 acres, though it may probably be cheapened and simplified, so as to make it ultimately useful on a smaller scale."

From the British Farmers' Magazine.

HISTORY OF THE NUTMEG.

The tree called *myristicha moschata* by botanists, grows naturally in a group of islands forming a part of the Moluccas, called the Isles of Banda, in the Indian Archipelago: a cluster which seems to have been thrown up by the sea in some volcanic effort, as there is now upon one of them, named Gonong Api, a volcano, constantly emitting smoke, and often flames. The first island, Banda Nieira, is the chief settlement, and contains two forts: its harbor is spacious, but difficult of access. The second is Banda Lantoir: the third and fourth in importance are Pulo way and Pulovun. These four islands were the only places where the cultivation of the nutmeg was allowed by the Dutch, but there are several others under the same government. What these islands produce in superfluities, they want in necessaries. The soil is a rich black mould, but it produces no corn, the natives subsisting chiefly upon sago. The nutmeg tree grows like a pear tree in form and size; its leaf resembles that of the laurel, being of a bright green color on the upper surface, and grayish underneath: when bruised, it diffuses an aromatic perfume. The flowers are white, small and scentless. The fruit is similar to a wal nut in form, but more fleshy and full of juice. The external pulp dries up to a crust of a deep yellow color, which, opening at one side, discloses a membraneous coat of a beautiful red tint, known to us by the name of mace, which lies immediately over the thin and brittle shell of the nutmeg. This is the time to gather the fruit; if left longer on the tree, the mace would get loose, and the nutmeg would lose that oil, which preserves it, and which is one of the great excellences of the fruit. The nutmegs, which are gathered before they are perfectly ripe, are preserved in vinegar or sugar. The tree yields three crops annually, the first in April, which is the best, the second in August, and the third in December, yet the fruit requires nine months to ripen it: thus the tree is constantly bearing flowers and fruit at the same time. After the fruit is gathered, the outer covering is stripped off, and the mace being carefully separated from the kernel, is laid in the sun to dry. The nuts require more preparation; they are spread upon hurdles, and dried for six weeks, before a slow fire, in sheds erected for the purpose. After this they are separated from the shell and thrown into a strong mixture of lime and water, which is a necessary precaution to preserve them from worms: with the same intention the mace is sprinkled with salt water. After this process, the fruit is cleaned, and packed up for exportation.

It appears, from experience, that only one-third of the nutmeg trees bear fruit, but this cannot be discovered until the twelfth or fourteenth year of their growth; therefore, they must not be cut down at an earlier age. The fruit-bearing property is of short duration, as the tree will yield only from the twelfth to the twentieth year, and generally perishes at the age of twenty-four years.—The nutmeg tree delights in a damp soil, overgrown with weeds, and even shaded with large trees, provided it be not stifled with them. Under the shelter of the *canarium commune* (?) it thrives very well, and bears the cold of the tops of the mountains. The fruit differ in quality according to the age of the tree, the soil, and the method of culture. The round nutmeg is preferred to that which is oblong, though they are specifically the same. It ought to be fresh, moist, heavy, of a good scent, and an agreeable, though bitter flavor, and it should yield an oily juice when pricked.—The islands are divided into a number of plantations, under the management of a mixed race of Europeans and Indians.—The Dutch made use of many illiberal means to secure to themselves the exclusive possession of these valuable productions; many trees they destroyed, reserving only sufficient to produce a certain quantity of nutmegs; but finding the climate of Banda very unhealthy, and that a great number of their servants fell victims to it, they attempted to transfer the culture of this spice to Amboyna; these experiments have, however, proved unsuccessful.

In 1774, the English navigator, Forrest, found in a small island near New Guinea, called Manaswary, a nutmeg tree, the fruit of which was of an oblong shape, but well flavored. This enterprising man plucked up about a hundred stems of the tree, and slanted them in 1776, on the island of Bunwoot, which had just been ceded to him for the East India Company, by the Sultan of Mindanao. Bunwoot is situated to the north east of Borneo, and is a healthy spot, covered with beautiful trees.

Libilliadiere also found the nutmeg tree upon the little island of Cocos, near the northern extremity of New Ireland. The fruit, when he saw it, was unripe, and of an oblong form. The island is covered with evergreen trees, among which the *Barringtonia speciosa* is conspicuous. It extends its branches laden with flowers horizontally a great way over the sea.* There are few cocoa-nut trees, but many figs of different kinds. Fruits of several species of the screw pine, of the *Barringtonia*, and of the *Heritiera*, which trees stretched their branches and even their trunks, in a very remarkable manner over the sea. It is thus, no doubt, that the seeds of plants are conveyed from one island to another without the assistance of man. Where there are no rills to carry fruits to the sea, the want of moisture prompts these trees to bend over the ocean, and obtain from its evaporation the nourishment they require.

The principal of the Molucca islands are Amboyna, noted for the cultivation of the clove-tree; to which may be added Ceram, Ternate, Tidore, and Batchean.—Ceram is a large island to the north of Amboyna. Several chains of mountains run parallel to each other in a direction from east to west, and separated by fertile vallies containing luxuriant vegetation. In ancient times the peninsula of Hoewamochel produced large quantities of nutmegs, but the trees were extirpated by the Dutch about the year 1697. At present it is covered with sago trees (*cycas circinales.*) The wood usually called Amboyna, and the Salmoni, both of which are exported from Amboyna for the purposes of ornamental cabinet work, are mostly the productions of Ceram. Along the shores of this island, uncommonly fine shells are found.

Ternati is only about twenty-four miles in circumference. Larger nutmegs are found on it than any procured at Banda: but the culture of them is discontinued.

Tidore, the next of these islands, lies to the south of Ternate, and, like that island, is mountainous, and well watered by streams from peaks which are generally capped with clouds. In 1521, Juan Carvallo, one of the surviving companions of Magellan, arrived at Tidore, where he was well received, and allowed to load two ships with spices for Spain. The Portuguese and Spaniards after this traded to the island. In 1579, Drake arrived there and began to gather spices without having permission from the king, who was at first greatly incensed, but was afterwards appeased by presents. The inhabitants of all these islands are Malays.

The Chinese landing upon the Moluccas were the first discoverers of the clove and nutmeg. These new acquisitions were soon admired all over India, whence they were conveyed to Persia and Europe. The Arabians repaired to the islands but were driven out by the Portuguese, who, in their turn, yielded to the Dutch in the year 1621. After being alternately in the possession of their conquerors and the English, they were finally taken possession of by the latter in 1810. I have named those of the Moluccas only which are noted for their spices. Among the numerous small islands comprehended under the same government, are several producing various articles of exportation.

When we reflect upon such productions of nature as those of which I am treating, we must admire the beneficence of the Almighty, in having provided us with the means of varying, according to our particular taste, the flavor of the food necessary to our sustenance: how much more grateful ought we to be for those higher blessings of intelligence and industry, without which the treasures of the east would have remained confined to the distant spots where they grow. We import from these and other lands, luxuries, which by constant use almost become necessaries to us: we ought at least to bestow in return, the blessings and virtues of civilization. Many Europeans have and are attempting this, but it is to be feared that, until by some great revolution in the moral world, the degrading traffic in slaves be entirely abolished, civilization will make but slow progress in the three quarters of the world thus disgraced.—We are assured that the "knowledge of the Lord shall cover the earth as the waters cover the sea," and although we shall not see that period, we must trust that it will arrive; and that then the gentle Hindoo and the savage Malay, shall be united in the bonds of Christian peace and brotherly love.—[Mag. of D. E.]

*This circumstance is remarked by every voyager passing through among these islands.

From the Journal of the American Institute.

INFORMATION TO PERSONS HAVING BUSINESS TO TRANSACT AT THE PATENT OFFICE.

All former acts are repealed by the act passed 4th July, 1836.

"Patents are granted for any new and useful art, machine, manufacture or composition of matter, or any new and useful improvement on any art, machine, manufacture or composition of matter, not known or used by others before his or their discovery or invention thereof, and not at the time of his application for a patent in public use, or on sale with his or their consent or allowance, as the inventor or discoverer."

The term for which a patent is granted is fourteen years; but may, under certain circumstances, be renewed for seven years, as hereinafter mentioned.

Patents are granted to citizens of the United States, to aliens who shall have been resident in the United States one year next preceding, and shall have made oath of their intention to become citizens thereof, and also to foreigners who are inventors or discoverers.

A patent may be taken out by the inventor in a foreign country without affecting his right to a patent here, if the patent is not delayed in this country longer than six months from the time of taking it out abroad; and any publicity in consequence of such foreign patent does not affect his right to a patent in the United States. A patent is not granted upon introduction of a new invention from a foreign country, unless the person who introduced it be the inventor or discoverer. If an alien neglects to put and continue on sale the invention in the United States, to the public, on reasonable terms, for eighteen months, the patentee loses all benefit of the patent.

Joint inventors are entitled to a joint patent, but neither can claim one separately.

An inventor cannot assign his right before a patent is obtained, so as to enable the assignee to take out a patent in his own name.

The assignment of a patent may be the whole or undivided part, "by any instrument in writing." All assignments, and also the grant or conveyance, of the use of the patent in any town, county, or State, or limited district, must be recorded in the patent office within three months from the date of the same; for which record the grantee or assignee must pay three dollars to the patent office.

All applications pending on the 4th July, 1836, (the time of passing the said act,) on which the duty of thirty dollars has been paid, will be considered as presented under the new act, and will not require a new petition. In all other cases the papers will be returned for correction with this circular explanatory.

"In case of the decease of an inventor, before he has obtained a patent for his invention, the right of applying for, and obtaining, such patent, shall devolve on the administrator or executor of such person, in trust for the heirs at law of the deceased, if he shall have died intestate; but if otherwise, then in trust for his devisees, in as full and ample manner, and under the same conditions, limititations, and restrictions as the same was held, or might have been claimed or enjoyed, by such person in his or her lifetime; and when application for a patent shall be made by such legal representatives, the oath or affirmation shall be so varied as to be applicable to them."

The patent office will be open for examination during office hours, and applicants can personally, or by attorney, satisfy themselves, on inspection of models and specifications, of the expediency of filing an application for a patent.

All fees received are paid into the treasury, and constitute a fund to defray the expenses of the office: hence the law has required the payment of the patent fee before the application is considered; two thirds of which fee is refunded on withdrawing the petition.

It has hitherto been the practice for inventors to send a description of their inventions to the office, and inquire whether there is any thing like it, and whether a patent can be had. As the law does not provide for the examination of descriptions of new inventions, except upon application for a patent, no notice can be taken of such inquiries.

On the application for a Patent.

No application will be considered until the fee for the patent is paid.

The application for a patent must be made by petition to the *commissioner of patents*, signifying a desire of obtaining an exclusive property in the invention or discovery, and praying that a patent may be granted therefor, as in the form annexed hereto, *which petition should be signed by the inventor.*

Description of Specification.

"Before any inventor shall receive a patent for any such new invention or discovery, he shall deliver a written description of his invention or discovery, and of the manner and process of making, constructing, using, and compounding the same, in such full, clear, and exact terms, avoiding unnecessary prolixity, as to enable any person skilled in the art or science to which it appertains, or with which it is most nearly connected, to make, construct, compound, and use the same; and in case of any machine, he shall fully explain the principle, and the several modes in which he has contemplated the application of that principle, or character by which it may be distinguished from other inventions; and shall particularly specify and point out the part, improvement, or combination, which he claims as his own invention or discovery."

It is recommended in all cases where the machine or improvement is complicated, to frame the specification with reference to the drawings.

A *defective description* or specification may be amended any time before issuing the patent

For a new Improvement.

"Whenever the original patentee shall be desirous of adding the description and specification of any new improvement of the original invention or discovery, which shall have been invented or discovered by him subsequent to the date of his patent, he may, like proceedings being had in all respects as in the case of original applications, and on the payment of fifteen dollars, as herein after mentioned, have the same annexed to the orignal description and specification; and the commissioner shall certify, on the margin of such annexed description and specification, the time of its being annexed and recorded; and the same shall thereafter have the same effect in law, to all intents and purposes, as though it had been embraced in the original description and specification."

"Every inventor, before he can receive a patent, must make oath or affirmation, that he does verily believe that he is the original and first inventor or discoverer of the art, machine, manufacture, composition, or improvement, for which he solicits a patent, and that he does not know or believe that the same was ever before known or used, and also of what country he is a citizen." (See form annexed.)

If the applicant be an alien, and have resided one year in the United States preceding the application, and have given legal notice of his intention to become a citizen of the United States, he must make oath to these facts before he can claim a patent, for the same sum paid by a citizen.

Of Drawings, and specimens of Ingredients.

The law requires, that "the applicant for a patent shall accompany his application with drawing or drawings, and written references, when the nature of the case admits of drawings." These drawings should be according to the rules of perspective, and neatly executed; and such parts as cannot be shown in perspective, must, if important, be represented in section or detail. When the specifications refer to the drawings, duplicates of them are required, as one must accompany the patent when issued, as explanatory of it, and one must be kept on file in the office.

The drawings must be signed by the patentee, and attested by two witnesses: many drawings have been transmitted without any name or references.

Drawings are necessary, even though a model be sent.

Of Models.

The law requires that the inventor shall deliver a model of his invention or improvement when the same admits of a model. The model should be neatly made, and as small as a distinct representation of the machine or improvement, and its intended properties, will admit; and the name of the inventor should be printed *upon* or *affixed* to it, in a *durable* manner. Many models have been forwarded without a name, and therefore lost or mislaid.

Models must be forwarded at the expense of the applicant.

When the invention is of a "a composition of matter," the law requires that the application be accompanied with specimens of the ingredients, and of the composition of matter, sufficient in quantity for the purpose of experiment.

Proceedings on applications for Patents, and on appeals from the decision of the Commissioner.

"That on the filing of any such application, description, and specification, and the payment of the duty hereinafter provided, the commissioner shall make, or cause to be made, an examination of the alleged new invention or discovery; and if, on any such examination, it shall not appear to the commissioner that the same had been invented or discovered by any other person in this country, prior to the alleged invention or discovery thereof by the applicant, or that it had been patented or described in any printed publication in this or any foreign country, or had been in public use or on sale, with the applicant's consent or allowance, prior to the application, if the commissioner shall deem it to be sufficiently useful and important, it shall be his duty to issue a patent therefor. But whenever, on such examination, it shall appear to the commissioner that the applicant was not the original and first inventor or discoverer thereof, or that any part of that which is claimed as new had before been invented or discovered, or patented, or described in any printed publication, in this or any foreign country, as aforesaid or that the description is defective and insufficient, he shall notify the applicant thereof, giving him briefly such information and references as may be useful in judging of the propriety of renewing his application, or of altering his specification, to embrace only that part of the invention or discovery which is new. In every such case, if the applicant shall elect to withdraw his application, relinquishing his claim to the model, he shall be entitled to receive back twenty dollars, part of the duty required by this act, on filing a notice in writing of such election in the patent office, a copy of which, certified by the commissioner, shall be a sufficient warrant to the treasurer for paying back to the said applicant the said sum of twenty dollars.—But if the applicant, in such case, shall persist in his claim for a patent, with or without any alteration of his specification, he shall be required to make oath or affirmation anew, and in manner as aforesaid; and if the specification and claim shall not have been so modified as, in the opinion of of the commissioner, shall entitle the applicant to a patent, he may, on appeal, and upon request in writing, have the decision of a board of examiners, to be composed of three disinterested persons, who shall be appointed for that purpose by the Secretary of State, one of whom, at least, to be selected, if practicable and convenient, for his knowledge and skill in the particular art, manufacture, or branch of science to which the alleged invention appertains, who shall be under oath or affirmation for the faithful and impartial performance of the duty imposed upon them by said appointment. Said board shall be furnished with a certificate, in writing, of the opinion and decision of the commissioner, stating the particular grounds of his objection, and the part or parts of the invention which he considers is not entitled to be patented. And the said board shall give reasonable notice to the applicant, as well as to the commissioner, of the time and place of their meeting, that they may have an opportunity of furnishing them with such facts and evidence as they may deem necessary to a just decision; and it shall be the duty of the commissioner to furnish to the board of examiners such information as he may possess relative to the matter under their consideration. And on an examination and consideration of the matter by such board, it shall be in their power, or of a majority of them, to reverse the decision of the commissioner, either in whole or in part; and their opinion being certified to the commissioner, he shall be governed thereby in the further proceedings to be had on such application: *Provided however*, That before a board shall be instituted in any such case the applicant shall pay to the credit of the treasurer, as provided in ninth section of this act, the sum of twenty five dollars; and each of said persons so appointed, shall be entitled to receive for his services, in each case, a sum not exceeding ten dollars, to be determined and paid by the commissioner, out of any money in his hands, which shall be in full compensation to the persons who may be so appointed, for their examination and certificate as aforesaid."

Re issue to correct a defective description.

When the applicant wishes to cancel his old patent, for a mistake or inadvertence, he should state the reasons in his application, and expressly surrender the old patent, which must be transmitted to the patent office before a new patent will be issued.—Section thirteen enacts: "That whenever any patent which has heretofore been granted, or which shall hereafter be granted, shall be inoperative or invalid, by reason of a defective or insufficient description or specification, or by reason of the patentee claiming in his specification, as his own invention, more than he had or shall have a right to claim as new, if the error has, or shall have arisen by inadvertancy, or accident, or mistake, and without any fraudulent or deceptive intention, it shall be lawful for the commissioner, upon the surrender to him of such patent, and the payment of the further duty of fifteen dollars, to cause a new patent to be issued to the said inventor, for the same invention, for the residue of the period then unexpired for which the original patent was granted, in accordance with the patentee's corrected description and specification."

And in case of his death, or any assignment by him made of the original patent, a similar right shall vest in his executors, administrators, or assignees, and the patent, so reissued, together with the corrected description and specification, shall have the same effect and operation in law, on the trial of all actions hereafter commenced for causes subsequently accruing, as though the same had been originally filed in such corrected form before the issuing out of the original patent.

Interfering Applications.

"Whenever an application shall be made for a patent, which in the opinion of the commissioners, would interfere with any other patent for which an application may be pending, or with any unexpired patent which shall have been granted, it shall be the duty of the commissioner to give notice to such applicants, or patentees, as the case may be; and if either shall be dissatisfied with the decision of the commissioner on the question of priority of right or invention, on a hearing thereof he may appeal from such decision, on the like terms and conditions as are provided in the case of applications for inventions not new; and the like proceedings shall be had to determine which, or whether either of the applications is entitled to receive a patent, as prayed for."

Caveats.

The law enacts, "that any citizen of the United States, or alien, who shall have been resident in the United States one year next preceding, and shall have made oath of his inention to become a citizen thereof, who shall have invented any new art, machine, or improvement thereof, and shall desire further time to mature the same, may, on paying to the credit of the treasury, in manner as provided in the ninth section of this act, the sum of twenty dollars, file in the patent office a caveat setting forth the design and purpose thereof, and its principal and distinguishing characteristics, and praying protection of his right, till he shall have matured his invention: which sum of twenty dollars, in case the person filing such caveat shall afterwards take out a patent for the invention therein mentioned, shall be considered a part of the sum herein required for the same. And such caveat shall be filed in the confidential archives of the office, and preserved in secrecy. And if application shall be made by any other person, within one year from the time of filing such caveat, for a patent of any invention with which it may in any respect interfere, it shall be the duty of the commissioner to deposite the description, specifications, drawings and model, in the confidential archieves of the office, and to give notice, by mail, to the person filling the caveat, of such application, who shall, within three months after receiving the notice, if he would avail himself of the benefit of his caveat, file his description, specifications, drawings and model; and if, in the opinion of the commissioner, the specifications of claim interfere with each other, like proceedings may be had in all respects as are in this act provided in the case of interfering applications: provided, however, that no opinion or decision of any board of examiners, under the provisions of this act, shall preclude any person interested in favor of or against the validity of any patent which has been, or may hereafter be granted, from the right to contest the same in any judical court, in any action in which its validity may come in question."

Extension of the patent beyond the fourteen years.

Section eighteen enacts: "That whenever any patentee of an invention or discovery shall desire an extension of his patent beyond the term of its limitation, he may make application therefor, in writing,

to the commissioner of the patent office, setting forth the grounds thereof; and the commissioner shall, on the applicant's paying the sum of forty dollars to the credit of the treasury, as in the case of an original application for a patent, cause to be published, in one or more of the principal newspapers in the city of Washington, and in such other paper or papers as he may deem proper, published in the section of country most interested, adversely, to the extension of the patent, a notice of such application, and of the time and place when and where the same will be considered, that any person may appear and show cause why the extension should not be granted. And the Secretary of State, the commissioner of the patent office, and the solicitor of the treasury, shall constitute a board to hear and decide upon the evidence produced before them, both for and against the extension, and shall sit for that purpose at the time and place designated in the published notice thereof. The patentee shall furnish to said board a statement, in writing, under oath, of the ascertained value of the invention, and of his receipts and expenditures, sufficiently in detail to exhibit a true and faithful account of loss and profit, in any manner accruing to him from and by reason of said invention. And if, upon hearing of the matter, it shall appear to the full and entire satisfaction of said board, having due regard to the public interest therein, that it is just and proper that the term of the patent should be extended, by reason of the patentee, without neglect or fault on his part, having failed to obtain, from the use and sale of his invention, a reasonable remuneration for the time, ingenuity and expense bestowed upon the same, and the introduction thereof into use, it shall be the duty of the commissioner to renew and extend the patent, by making a certificate thereon of such extension, for the term of seven years, from and after the expiration of the first term; which certificate, with a certifinate of said board of their judgment and opinion as aforeraid, shall be entered on record in the patent office; and thereupon the said patent shall have the same effect in law as though it had been originally granted for the term of twenty-one years; and the benefit of such renewal shall extend to assignees and grantees of the right to use the thing patented, to the extent of their respective interest therein: *Provided, however*, That no extension of a patent shall be granted after the term for which it was originally issued."

Fees payable at the Patent Office.

All fees must be paid in advance: the amount is fixed by law, except in the case of drawings, the expense of which will be communicated on application for the same.

Every applicant must pay into the treasury of the United States, or into the patent office, or into any of the deposite banks, to the credit of the treasurer, on presenting his petition, as follows:

If a citizen of the United States	$30 00
If a foreigner, who has resided in the United States one year next preceding the application for a patent, and shall have made oath of his intention to become a citizen	30 90
If a subject of the King of Great Britain	500 00
All other foreigners	300 00
On entering a caveat	20 00
On entering an application for the decision of arbitrators, after notice from the commissioner that the patent is not new, or interferes with a pending application or caveat	25 00
On extending a patent beyond the fourteen years	40 00
For recording each assignment or transfer of patent	3 00
For adding to a patent the specification of a subsequent improvement	15 00
On surrender of old patent, and new issue for mistake or inadvertence of patentee	15 00
For copies of patents, or any other paper on file, for each 100 words	10
For copies of drawings, a reasonable sum in proportion to the time occupied in making the same	

N. B. The patent office does not make original drawings to accompany applications for patents, and gives only copies of the same after the patent is completed.—Draughtsmen in the city of Washington are always ready to make drawings, at the expense of the patentees.

Communications to and from the patent office are free of postage.

All fees, if sent to the commissioner of patents, should be transmitted in gold or silver coin, when they amount to less than five dollars, as bank notes under that sum will not be received.

It is recommended to make a deposite in a deposite bank, for the fee for the patent, and remit the certificate. Where this cannot be done without much inconvenience, gold may be remitted by mail, free of postage; and this is preferred to the bills of the deposite banks, which, however, will not be refused.

In case of deposites, made in the deposite banks, a duplicate receipt should be taken, stating by whom the payment is made, and for what object. The particular patent should be referred to, to enable the applicant to recover back the twenty dollars in case of withdrawal of the petition.

On recovering back Money paid for Patents not taken out.

When a patentee relinquishes or abandons the application for a patent, he must petition the commissioner of patents, stating the abandonment or withdrawal of his petition, in which case twenty dollars will be repaid.

In case of withdrawing petition, the model deposited is by law retained.

Further remedy in Equity for Patentees.

In case of intefering applications with other pending applications or unexpired patents or caveats, a hearing is had before the commissioner of patents prior to the appeal to a board of arbitrators. In other cases the decision of the commissioner on the novelty and utility of the invention is made without a hearing, and from which an appeal may be taken to a court of arbitrators.

When the decision of the board of arbitrators shall be unsatisfactory to a party interested, a bill of equity can be filed in the United States courts, whose decision will be imperative.

On filing the Specification and Drawings as a Caveat.

"Whenever the applicant shall request it, the patent shall take date from the time of filing the specification and drawings, not however exceeding six months prior to the actual issuing of the patent; and, on like request, and the payment of the duty herein required, by any applicant, his specification and drawing shall be filed in the secret archieves of the office until he shall furnish the model, and the patent be issued, not exceeding the term of one year, the applicant being entitled to notice of interfering applications."

A full description of the invention is required to enable the commissioner of patents to judge of interferences.

All applications will be examined, and patents issued, in the order of time in which the proper documents are completed.

Exhibitions of Model and Manufactures.

Unpatented models, specimens of compostions, and of fabrics, and other manufactures or works of art, will be received and arranged in the national repository of the patent office as soon as the new buiding is finished.

Personal attendance of the applicant at the patent office, to obtain a patent, is unnecessary. The business can be done by correspondence (free of postage) or by power of attorney.

Oaths.

Any magistrate authorised to administer oaths is qualified to certify under this act.

Form of Petition.

To the Commissioner of Patents:

The petition of Sebastian Cabot, of Cabotsville, in the county of Hampden and State of Massachusetts,

Respectfully represents:

That your petitioner has invented a new [and improved mode of preventing steam boilers from bursting,] which he verily believes has not been known or used prior to the invention thereof by your petitioner. He therefore prays that letters patent of the United States may be granted to him therefor, vesting in him and his legal representatives the exclusive right to the same, upon the terms and conditions expressed in the act of Congress in that case made and provided; he having paid thirty dollars into the treasury, and complied with the other provisions of the said act.

SEBASTIAN CABOT,

Form of Specification.

To all whom it may concern:

Be it known, that I, Sebastian Cabot, of Cabotsville, in the county of Hampden, and state of Massachusetts, have invented

a new and improved mode of preventing steam boilers from bursting, and I do hereby declare that the following is a full and exact description:

The nature of my invention consists in providing the upper part of a steam boiler with an aperture, in addition to the safety valve, to be closed up with a plug or disk of alloy, which will fuse at any given degree of heat, to be governed by the proportions forming the alloy, and permit the steam to escape, should the safety valve fail to perform its functions.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construtions and operation: I construct my steam boiler in any of the known forms, and apply thereto gauge cocks, a safety valve, and the other appendages of such boilers; but in order to obviate the danger arising from the adhesion of the safety valve, and from other causes, I make a second opening in the top of the boiler, similar to that made for the safety valve, and in this opening I insert a plug or disk of fusible alloy, securing it in its place by a metal ring and screws, or otherwise. This fusible metal I, in general, compose of a mixture of lead, tin, and bismuth, in such proportions as will insure its melting at a given temperature, which must be that to which it is intended to limit the steam, and will, of course, vary with the pressure the boiler is intended to sustain. I surround the opening containing the fusible alloy, by a tube intended to conduct off any steam which may be discharged therefrom. When the temperature of the steam in such a boiler rises to its assigned limit, the fusible alloy will melt, and allow the steam to escape freely, thereby securing it from all danger of explosion.

What I claim as my invention, and desire to secure by letters patent, is the application to the steam boilers, of a fusible alloy which will melt at a given temperature, and allow the steam to escape, as herein described; using for that purpose any metallic compound which will produce the intended effect.

Witnesses: SEBASTIAN CABOT.
JOHN DOE.
RICHARD ROE.

If the thing desired to be patented be an original machine, the title, in that part of the petition and specification between brackets, should be altered thus: [have invented a new and useful machine, &c.] and if an improvement only, thus: [have invented a new and useful improvement on a, or on the, machine, &c.]

Form of Oath.

County of Hampden, State of Massachusetts, ss.

On this day of 183, before the subscriber, a justice of the peace in and for the said county, personally appeared the within named Sebastian Cabot, and made solemn oath (or affirmation) that he verily believes himself to be the original and first inventor of the mode herein described, of preventing steam boilers from bursting, and that he does not know or believe that the same was ever before known or used; and that he is a citizen of the United States:

Signed, A. B., Justice of the Peace.

If the following questions can be answered affirmatively before transmitting the papers, few applications will be returned for correction of omissions:

1. Is the fee transmitted?
2. Is the petition signed, and directed to the commissioner of patents?
3. Is the specification signed, and witnessed by two witnesses?
4. Are the drawings signed, and witnessed by two witnesses?
5. Do the drawings contain references? and if the specificatio refers to them, are duplicates sent?
6. Has the inventor made oath to his being a citizen, and that his invention is new, &c.
7. Does the specification contain a specific claim?
8. If an alien and resident, is this affirmed or sworn to?
9. Has the model been sent, and how?
10. Is the name of the inventor durably affixed to the same?
11. In case of reissue, is the old patent surrendered?
12. Has the oath of invention been renewed, before applying for a board of arbitrators?
13. Have the fees under $5 been remitted in coin?

All communications should be addressed to the commissioner of patents.

HENRY L. ELLSWORTH,
Commissioner of Patents.

THE LATE HON. JOHN B. YATES.—We take from the Albany Argus the following extract from the will of the late Hon. John B. Yates. It is quite unnecessary to eulogise the character of a man who dispenses the fruits of a life of industry in the manner which Mr. Yates proposes in his will to do. We should think more favorably of mankind if similar instances of liberality were more frequent:—

THE WILL OF THE LATE JOHN B. YATES, ESQ.

We have been favored with an extract of this will, drawn by the testator himself, and lay it before our readers. It furnishes evidence of that enlarged and philanthropic intellect for which Mr. Yates was distinguished throughout his whole life. A large estate, between *three and four hundred thousand dollars*, over and above a very ample support for his widow, and other legacies, he has set apart for the purposes of literature and science. He has shown, in his dying moments, his regard for the morality, happiness and character of his country. Indeed, this was his 'master passion, strong in death,' and posterity will enrol his name among its noblest benefactors. During his life, he evinced the same unceasing solicitude for the general good. Aware that the perpetuity of our republican institutions could be best secured by a general diffusion of intelligence, no man was more active in the cause of education than he. The emphatic and no less interesting injunction contained in his address delivered in February last to the State Agricultural Society, exemplifies the deep interest he felt in its cause. These are his words: 'Do you wish, quietly, without injustice and without violence, to equalize property as conducive to the greater safety of the republic? and in fine do you wish to foster any hope to preserve your republic?—educate thoroughly your whole community.' At his own expense he established the Polytechny School at Chittenango, which was ably conducted, and continued in successful operation ten years.—His financial operations and unremitting exertions, in connexion with his partners, raised Union College from a state of comparative insolvency to that of opulence and distinction. We have no doubt that the legislature of this State will give every aid in its power to promote the great and benevolent objects of the testator, and thus furnish a monument more durable than marble to the memory of its truly patriotic and benevolent founder.

He conveys all his property to Mrs. Yates, his widow, Charles Yates, William K. Fuller, and George K. Fuller, *in trust*; and after providing for certain bequests, he directs as follows:

'I direct further that my said trustees apply the remainder of my property, my real and personal estate, if any there shall be, to the endowment and support of a school embracing literary instruction, combined with the pursuits of real life of every practical description. The institution to be called the *Polytechny*, upon the plan as near as may be, laid down in the memorial presented by me to the legislature of the State of New-York, and the report of a committee and draft of a law founded thereon, during the session of the year 1830. If after winding up my affairs, it shall be ascertained that there are funds sufficient left to commence and found such institution, I then wish my trustees aforesaid to petition the legislature of this State to accept this devise for the object named, to confirm its permanency by a legislative act, and make the necessary arrangement for its uniform and steady government by the appointment of a Governor or Director, who shall not be liable to removal by the fluctuations of party or the miserable *charlatanry* of political jugglers.

'If such a law to the satisfaction of my said trustees, cannot be obtained in this State, I then direct that as soon as may be, without incurring unnecessary loss, my whole estate left after the legacies and devises be disposed of, on the terms and in the manner that shall be thought most advantageous, and as it shall from time to time be disposed of or sold in such portions as may be offered at the various times, and the money received therefor, that the same be invested until the sum of one hundred thousand dollars be funded, and they are requested in that event to form such an institution in any State which a majority of them please to select, which is willing to give the proper irrevocable legal guaranty for its permanency, and appropriate not less than one thousand acres of land for the purpose. The income only of the one hundred thousand dollars to be applied in this last case to the support of the institution, and the principal to be transferred to the State, and kept by it invested for a school of this description. If afterwards, a greater residuary sum than this shall be realized, I then direct that the balance, not exceeding one hundred thousand dollars, be offered on the same terms to another State, and so on until the whole residuary estate be thus applied and absorbed in amounts not exceeding as above one hundred thousand dollars to each.

Having ascertained with certainty to my own mind, that almost all political men of all parties are more particularly anxious for personal aggrandizement than any permanent arrangements by which the general standard of popular information may be raised, and thus greater stability be given to the political institutions of our country, I am apprehensive of the same secret opposition which I have experienced and which I know exists to every project of the sort. It is therefore my wish that a printing press, and weekly paper at least, devoted to the purpose of advocating literary information among all classes of people, be established, connected with the institution, and that printing and book-binding in all its branches, form a branch of mechanical occupation of a portion of the students in the institution. It is also my will that a professorship of law be established, and that every student be made familiar with the constitution of the United States and each State in the Union, at as early an age as possible, and to be connected throughout with the moral and religious instructions of the institution. Being also firmly persuaded that the safety of society and its proper moral government cannot be sustained without a high regard for the present legal domestic relations in life, it is therefore my wish that no illegitimate child shall be admitted into the institutions whose parents shall not have legally intermarried, either before or after the birth of the child, and that such prohibition be made a fundamental law of each institution which may be established under this will. If my life shall not be spared to settle my estate myself, and ascertain its value, so as to know accurately what may be left for this purpose, and also enable me to form a more full and detailed plan for the government and management of the institutions, and the specific approriations for each object, which, from the uncertainty of the amount, I cannot now do, I leave the manner and extent of the arrangements to the sound discretion of my said trustees, in conjunction with my friends John Savage, chief justice of the State, John Van Ness Yates, of Albany, and John C. Spencer of Canandaigua, whom I solicit to aid my trustees by their counsel and advice in organizing and establishing the said institutions.'

EDWARD TROUGHTON, ESQ., F.R.S., L. AND E., F.R.A.S. AND F.R.S.C.E.

The late Edward Troughton was born in a small village in Cumberland, in the year 1754, where he received merely a common education in the village school. When seventeen years of age he came to London, and apprenticed himself to his brother John, a respectable mathematical instrument maker, carrying on business at No. 136, Fleet-street; and when out of his time was taken into partnership, and ultimately succeeded to the business, and ever after continued to reside there; and it is not a little remarkable, that the same spot has been successively occupied by mathematical instrument makers of celebrity of nearly two hundred years; and here a Sutton, a Wright, a Cole, and a Troughton, labored with unwearied zeal for the advancement of science. In a very short time after Mr. Troughton's arrival in the metropolis, he began to display that great originality of genius, which in the end made all scientific men look up to him for the means of prosecuting their pursuits with the fullest effect—for be it remembered, that the sublime study of astronomy must ever be obscure without instruments of the most acurate execution, because the theorems of mathematicians are useless without data to act on—and with this he supplied them; presenting to all competent persons the means of *dividing* instruments with the most perfect accuracy, and by which they have been graduated to such a degree of exactness, that error is not to be discovered in them even by high optical powers; and many of his instruments of large dimensions are placed in various observatories, and by them a catalogue of the fixed stars, and the sun, moon and planets, are now ascertained, and published in the *Nautical Almanac*. Many other skilful artists have also acted upon his improvement. The stability, accuracy, and commodious arrangement of his instruments leave nothing for the astronomer but to use them with care, as it is a fact, that the *declination* of some of the fixed stars have been ascertained by them to one third of a second. It is unnecessary to follow Mr. Troughton step by step, but a reference to a few of his great undertakings cannot be without interest. The Royal Observatory is furnished with a mural circle, a transit instrument, and a zenith sector, all of his contrivance; and the last was completed by him when in his 79th year: also, an equatorial instrument, for Trinity Colelge, Dublin; and which is now stationed at Armagh: and a meridian circle (made for Stephen Groombridge, Esq.,) now belonging to Sir James South; the whole of which are specimens not perhaps to be equalled either in beauty or figure, or perfect accuracy. He also remodelled the continental instruments so as to make the repeating circle of the Chevalier Borda, and the reflecting circle of Mayer, almost original inventions of his own. His nautical instruments, also, both as to construction and accuracy, are beyond all praise; and by them the mariner is now indeed enabled "to mark a road on the trackless ocean." Nor were his great labors wholly unrewarded; for the Royal Society, in 180 , presented him with the Copley Medal, for his elegant and valuable paper on Dividing. On the 7th of April, 1823, he received the freedom of the Clock Makers' Company; and in January, 1830, the King of Denmark presented him with a valuable gold medal, as an acknowledgment of his great and important improvements. In his latter years he devoted himself entirely to severe study and scientiac pursuit; and labored not merely in abstract theory, but for the improvement and direct benefit of the civilized world. Retaining his faculties to the last, he died on the 12th of June, 1835; and, according to his request, his remains were deposited in the General Cemetry, Kensal Green; and were followed by many, and deeply regretted by all the scientific world.——[New Monthly Magazine, for August.]

From the Repertory of Patent Inventions.

ON THE SOURCES AND COMPOSITION OF THE DIFFERENT KINDS OF GAMBOGE. BY DR. CHRISTISON; AND ON THE BOTANICAL ORIGIN OF GAMBOGE. BY DR. GRAHAM.

The papers of which the official abrtracts are subjoined, were lately read before the Royal Society of Edingburgh.

Gamboge was first made known by Clusius about the commencement of the seventeenth century, as a concrete juice from China. About the middle of the same century. Bontius conceived he had traced it to a particular species of *Euphorbia*, growing in Java and in Siam; from the latter of which countries the whole gamboge of commerce was at that time obtained. About the close of that century Hermann announced that gamboge was produced by two species of trees growing in Ceylon, which have been since often confounded together, but which are now designated by the names, *Garcinia Gambogia*, and *Stalagmitis gambogioides*. About the middle of last centry, gamboge was referred Linnæus to the former of these plants, and his reference was generally admitted; but about thirty years later, Professor Murray of Gottingen conceived he had traced it satisfactorily from the specimens collected by Koenig in Ceylon, and information obtained by the same botanists in Siam, to a new species which he called *Stalagmitis gambogioides*.

Dr. Graham shows, from specimens and drawings sent from Ceylon, both by Mrs. Colonel Walker to himself, and by David Anderson Blair, Esq. to the late Dr. Duncan, that the plant producing Ceylon gamboge is neither *Garcinia gambogia*, as Linnæus thought, nor *Xanthochymus ovalifolius*, as conjectured by Dr. Wight and Mr. Arnott, nor *Stalagmitis gambogioides*, according to Murray and Koenig, but is a species described by Lamarck and Gartner under the name of *Garcinia* or *Mangostana morella*, although it differs from all of these genera in the structure of its stamens, and, therefore, probably ought to be considered a new genus among those producing a gambogioid juice.

Dr. Christison proved, that, at the present time, Ceylon gamboge is not an article of European commerce, and that the whole gamboge of the markets of this country comes, as in the time of Bontius, from China. After mentioning the analysis of fine gamboge made by Braconnot in France, and John in Prussia, he stated the following as the mean composition of the several varieties of gamboge he has hitherto examined:—

Pipe gamboge of Siam:	
Resin	72·2
Arabin	23·0
Moisture	4.8
	100·0
Cake gamboge of Siam:	
Resin	64·8
Arabin	20·2
Fecula	5·6
Lignin	5·3
Moisture	4·1
	100·0

Ceylon Gamboge sent by Mrs. Colonel Walker:

Resin - - - -	70·2
Arabin - - - -	19·6
Fibre of wood and bark	5·6
Moisture - - - -	4·6

Ceylon gamboge,adhering to a specimen of the bark sent by Mr. David Anderson Blair:

Resin - - - -	75·5
Arabin - - - -	18·3
Cerasin - - - -	0·7
Moisture - - - -	4·8
	99·3

The proportion of the gum to the resin varied somewhat in each variety, but never differed more than two per cent. from the means given above.

The author added, that he had found the resin to be the active principle of gamboge.

He inferred from the composition of the different kinds of gamboge, and other circumstances detailed in his paper, that the cake gamboge of Siam is not entirely a natural production, but a manufactured article: that Ceylon gamboge, if freed from incidental fibrous matter, corresponds almost exactly with Siam gamboge: that therefore, they are probably produced by the same plant: that Ceylon gamboge possesses precisely the same medicinal properties; and that this variety, if more carefully collected, may, in all probability, be applied with equal advantage to every economical purpose which is at present served by the finest pipe gamboge of Siam.

A. T.

ON THE MATHEMATICAL FORM OF THE GOTHIC PENDANT. BY PROFESSOR FORBES.

The following is the official abstract of a paper read before the Royal Society of Edinburgh, on the 1st of February last, as given in the "Proceedings" of that learned body.

The author commenced by stating the general proofs of the knowledge of the principles of equilibrium displayed by Gothic architects in the structures (especially) of the Pointed style. The adaptation of their edifices was to the combined ends of elegance and strength. The extension of this principle to the case of the Gothic pendant is the chief object of this paper. Sufficiency in point of strength, without redundancy of material, is considered by the author as the primary source of architectural beauty, which he has demonstrated to be the case when the depending Gothic drop is generated by the revolution of the logarithmic curve round its axis. The condition of maintenance of a depending body, is, that the increment of the section may be in a constant ratio to the increment of weight of the body to be sustained. This is shown to be attained in the case of bare support, when the modulus of the logarithmic curve is equal to twice the modulus of cohesion of the substance of which the pendant is composed, in feet. Under these circumstances, the depending mass would be just within the limit of disruption, but its strength would be uniform throughout, and the tendency to separation would at no one point be greater than at another. It is not imagined that the Gothic architects could have had a mathematical knowledge of a curve, which was not attained till long after, but the degree of *tact*, by which the eye is guided in the selection and adaption of symmetrical forms, seems quite capable of explaining such an approximation to theory, which, it is believed, has not been before noticed. Thus, a depending cylinder appears overloaded at its inferior extremity, a cone towards its middle, and so of all figures which are not concave outwardly.

ANOTHER RAILROAD CONVENTION.

The delegates in the Knoxville Convention, from the State of Georgia, upon mature deliberation, believe it to be of the highest importance to the South of Georgia, that a Convention should be held at Macon on the first Monday of November next, for the purpose of consulting upon the expediency and practicability of building a railroad from some point on the Tennessee river below the Suck, through Georgia, to some point on the Atlantic. It is therefore earnestly desired that every county in the State should send delegates to this Convention equal at least, to the number of their Representatives in the Legislature. And in the mean time, it is hoped and desired that all the information touching this important enterprize, be collected and communicated either to A. S. Clayton, Esq., at Athens, Ga., Charles J. Jenkins, Esq., at Augusta, Ga., M H. McAlister, Esq., at Savannah, Washington Poe, Esq., at Macon, Henry S. Mosley, Esq., at Clayton, Jacob M. Scudder, Esq., at Coal Mountain, Forsyth county, or R. H. L. Buchanan, Esq., at New-Eachota, Cass county, who have been appointed a Committee of Correspondence for that purpose.—[Miners Recorder.]

WORTHY OF IMITATION.

LIBERALITY OF THE RAILROAD COMPANY.—At a meeting yesterday of the President and Directors of the Richmond and Fredericksburg Company, the following resolution was adopted:

The board being informed that many persons have freely released to this company all claim to damages for lands used by this company in making the railroad, and being desirous of making some suitable return therefor, doth resolve, that all persons who have given such releases shall have the privilege of transportation on the railroad for themselves, when they may desire the same, for a term of five years from this date. In case of the death within the term of five years of any person who has given such release, the board will hereafter make such provisions as may seem reasonable.

The President is directed to report to the board at its next meeting, a list of the persons who have given such releases, with a statement showing which of them have died, and who are the next of kin to those who have died.—[Richmond Compiler.]

From the Repertory of Patent Inventions

NEW MODE OF HEATING BOOKBINDES' LETTERING-TOOLS.

Sir,—It is a well known fact, that heat diffuses itself through metallic bodies with great rapidity; and this is exemplified when we plunge a piece of brass into melted lead, the former metal almost instantly attaining a degree of temperature equal to that of the latter.

This circumstance has induced me to conclude, that bookbinders' tools might be heated much more speedly, and with better effect, by dipping them into fused lead, or printers' type metal, or an alloy of lead and tin, than by exposing them, in the usual way, to a coke or charcoal fire. Sand floating on the surface of the fluid metal would, in a great degree, prevent the escape of its fume, and also retard its combination with the oxygen of the atmosphere.

An experienced bookbinder, to whom I stated my views, expressed his belief, that the adoption of the plan would be found very advantageous in finishing-shops, where gilding forms so important a part of the business.

I remain, Sir,
Yours respectfully,
Derby. T. COGGAN.

MINERAL WEALTH OF OUR COUNTRY.

Every day brings to light some new fossil treasure. We have seen some beautiful specimens of the Rossie lead found in St. Lawrence Co. This bed of ore has already been traced to a great distance from the spot where it was first met, and we have understood that it re-appears on the other side of the St. Lawrence, where copper is also found combined with small quantities of gold.

Two fine iron ore deposites have recently been discovered. The one is the "Winslow deposite," Sus. Co., N. J., being about thirty miles from this city. This one is very easy of reduction, while the yield is very considerable.

The other is at Troy, Vermont, owned by the Boston and Troy Iron Company. This ore yields about eighty per cent of superior Iron.

Those who are curious can see specimens of these ores at our office—where we are always happy to receive specimens. We conceive the Iron of our country to be worth more than gold to us. All hail to the *Iron Age*.—[Railroad Journal.]

STEAMBOAT NOVELTY.

When some time since we saw several articles going the rounds in the papers, denying the claim of Dr. Nott to the successful introduction of Anthracite coal as fuel in our large steamboats, we passed them without notice, not choosing to detail the improvements of Dr. Nott for the benefit of every scribbler who might feel inclined to criticise.

A more serious charge has been circulated, not indeed in print as we know, but at and about the landings on the river, and wherever else such gossip might prove entertaining to its authors and injurious to the Steamboat. We have heard of worthy

citizens who were induced to believe that a trip in the Novelty was at the peril of their lives!

For the benefit of those unacquainted with the boat or her machinery, we must unhesitatingly state, that in our opinion, and we judge from observation—that the construction of the machinery of the Novelty is such, that any accident from the rupture of a boiler is altogether avoided—such rupture not being at all likely to take place, and if it does, it can not do the slightest harm to any one, as they are *tubular*.

Boilers of a construction somewhat resembling these, have burst in situations (on board) where care was not taken, (we believe in Mr. Hancock's steam carriage for common roads) and the engineer himself was not aware of the peril!! The steam and water escaped through a small opening, (no large one can be made) and extinguished the fire—giving by the stoppage of the machine, the first indication of the accident.

On this very account we should prefer this construction as being the safest, even in careless hands, much more do we prefer it when applied in so beautiful a boat and conducted by such experienced and able men.

We may here remark that the prevalence of the report, coming under our notice, we deemed it proper to give our opinion on this subject, formed upon frequent examinations of the boilers and machinery, or rather to state the truth—as we shall always be ready to do, without invitation from any one, the writer of this article never having seen Dr. Nott, except in his good works.

The best mode however, of becoming satisfied of the safety and comfort of the improvements of Dr. Nott, as applied to useful purposes in the Novelty, is to go one or two trips to Albany on board of her.—[Railroad Journal.]

From the American Railroad Journal.

A PLAN WHEREBY A WOODEN RAILWAY SHALL BE RENDERED AS INDESTRUCTIBLE AS THE BEST IRON RAILROAD.

This plan consists in having the excavations and embankments, made sufficiently wide to admit a side ditch, or ditches, and *extra* embankments raised upon the outer edges of the road to an elevation of 15 or 18 inches above the plane of the roadway.—These *extra* embankments should be made about one foot wide on the top, with slopes of one and a half of base to one of perpendicular rise.

The *side ditch* or *ditches* with the *extra embankments*, and the *upper surface of the roadway* should be constructed with water tight materials, and the ditch or ditches made with the sufficient cross section to admit a quantity of water to feed the required distance. The cross section of the ditches will be greater upon the level parts of the road than on the descending planes, and greater at the end where the water is introduced, and decreasing toward the final discharge or waste of the water.

The *feeders* should be admitted at convenient distances, the less the distance from one feeder to another, the less will be required for the dimensions of the ditches. *Waste weirs* should be built at proper points, so as to discharge all surplus water, and the feeding gates should be regulated to give a certain quantity of water and no more, as near as the circumstances will admit.

After the wooden sleepers and rails are laid, with the iron plate put on, and the road completed for use, the water should be introduced and maintained to an elevation that will completely cover the rails, leaving the track about one inch under water.—This will be a sufficient depth, and need not be exceeded for the purposes here required to accomplish.

It is well known that wood *immersed completely under water* is thereby prevented from decay, hence a wooden railroad in the situation here described would last as long as the best constructed iron road.

The difference in cost of course would be different, as the circumstance and character of the ground would change, but I have no doubt but the average cost of railroad, upon this plan, would be $5000 per mile less than the double track iron road.

There is hardly any situation where railroads of any extent are made, but streams of water sufficient for the purposes required can easily be obtained. In the *winter season* the water should be drawn off or reduced at least two inches below the top of the rail. There is but little tendency to decomposition during the frosty weather, hence but little objection can be urged against this measure.

The slight obstruction the water would be to the rapid progress of the engine and cars would be nearly balanced by having a constant clean and uniform surface for the wheels to run upon, the friction would be more equal, consequently the moving power could be better regulated.

A thin light wooden box should be made to enclose the wheels from near their bearing surface over the top, in order to prevent the centrifugal force of the wheels in motion from throwing the water over the bodies of the engine cars, &c.

Many advantages might be enumerated in favor of this plan of making railroads. One is the uniformity which would be given to the temperature of iron plate, thereby correcting in a manner one of the great evils, the contraction and expansion of the iron plate. I believe, also, where a road should be made in this manner, and well settled there would not be half the liability to derangement. It is the alternate wetting and drying causing the contraction and expansion of materials, which eventually disorganizes the road.

From the Journal of the Franklin Institute.

ON CALCAREOUS CEMENTS. BY JAMES FROST, CIVIL ENGINEER. NO. IV.*

Having seen the intense affinity between lime and water, we will now endeavor to examine the superior affinity between lime and carbonic acid, with which lime is always found naturally and definitely combined in the proportion of twenty-eight lime and twenty-two carbonic acid. It is also, generally or always found mixed, and seemingly in combination with other substances; for, in the purest white Italian marble I have always found some minute silicious particles. Yet, carbonate of lime we shall hereafter find is never chemically combined with those other substances—whatever may be the hardness or specific gravity of the mass;—and as this is seemingly a position of some importance in geological investigations, it will be hereafter adverted to in connection with another part of equal importance, when we have had the advantage of considering some other combinations of lime.

In England, lime is generally procured by calcining the carbonates in two different modes. The one and most frequent, is the cheapest and easiest in practice, but the lime obtained in this way is generally found inferior in quality to that obtained by the more troublesome and expensive process.

As lime of as good quality may be obtained by the easier process, we will endeavor to describe the necessary conditions. In the first mode, the carbonate is interstratified with the smallest and cheapest coal, in inverted lime kilns, and the fuel being in actual contact, acts with the greatest effect. The kilns are of the cheapest construction and maintenance, and being daily emptied of a portion of calcined lime, and daily charged with an equal proportion of fresh materials, the business is regularly conducted in the easiest manner—but the lime thus obtained is of a variable quality, from some causes which must be explained in order to be avoided.

In the second mode the carbonates are piled in kilns so constructed that the fuel is burned in furnaces, and only the flame thereof admitted into the kilns to calcine the lime. In this mode, the coals used are large and of the dearest kind; more of them are required, as they do not act with so much effect; constant attendance is required night and day during the calcination; the kilns are more costly in construction and maintenance, and much expensive iron work is required.

If we calcine some limestone in an iron tube, or retort, set in a brick furnace, and then allow the retort to cool very slowly, while another portion of limestone is being calcined in a similar retort which is connected by an iron tube with the first, so that the carbonic acid gas may be conducted into the first retort, it will be there absorbed by the hot lime, which thus becomes uncalcined as it were, and is recarbonated more or less, according to the care taken in conducting the experiment.

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* No. III. was published in the April number of this Journal, page 234, vol. XVII.

If we now inquire why the first mode is so uncertain, we shall find that the kilns are commonly constructed about equal in diameter and depth, and that the most careful workmen find it difficult, or impracticable, to draw the calcined lime, so that portions of it do not intermix with portions of the uncalcined and of the fuel. In which case, a portion of uncalcined lime escapes calcination, and a portion of that which is calcined becomes more or less uncalcined, and a very irregular article is thus produced.

If lime kilns were always constructed of two or three diameters in depth, careful workmen might always draw without intermixing the calcined and uncalcined strata in the kilns, and a good article would always be produced at the least expense of time and trouble, and that this mode will succeed in practice with any description of limestone, will be apparent, when we state that the most difficult carbonates to calcine are those employed in the production of cements, which must be sufficiently calcined to become tender for grinding, while from their chemical qualities they are easily fusible with a small excess of fuel; now as these carbonates are well calcined in such kilns, it must be evident that all may be so, as no others can, from their nature, be so difficult to manage.

In either of the two modes of calcination the lime is allowed to cool in contact with the atmospheric air, and this we have already seen is essential to the production of lime. For, if having calcined lime in a reverberatory furnace, wherein coke has been used for fuel, and if then a fresh supply of fuel be added, and the supply of fresh air prevented to the furnace and to the chimney, by closing the apertures thereto, and the lime be thus allowed to cool, it will absorb and condense much sulphuretted hydrogen as well as carbonic acid gas, and when cool, will be incapable of slacking with water, and if pulverised and tempered with water, it will set as cement, for a long time thereafter, exhaling the peculiar odor of sulphuretted hydrogen.

If, when the lime is about to be thus cooled in a reverberatory furnace, a portion of pine wood is added to the other fuel, the lime when cool will be found nearly black throughout its whole substance by the vapor of carbon which has penetrated and been condensed therein; a black cement has been thus obtained, colored probably, as some black marbles are found by analysis to be; the Kilkenny or black Irish marble, owing its color to its containing two per cent more carbon than white marble, which always holds twelve per cent combined with oxygen in its carbonic acid, and Kilkenny marble holds only two per cent more, but being uncombined, it acts as coloring matter, showing what a great difference in sensible qualities is made by a small difference in the quantities and chemical arrangement of the elements of solid bodies.

Every different species of carbonate requires a different quantity of fuel for its due calcination, the argillaceous varieties requiring a quantity very nearly proportioned to the carbonic acid in them; hence, the inference is, that the heat evolved is essentially employed in converting the acid into permanent gas. Thus, two measures of small Newcastle coals, are required for the calcination of ten measures of Thames chalk, and is sufficient for fifteen measures of Roman cement stone; but as this latter substance is about one third ferruginous and argillacious matter, it would seem to require the expenditure of little fuel for that portion. As a measure of chalk is about twice as heavy as a measure of coal, it follows that ten pounds of coals are required to calcine 100 of carbonate, or one pound coals to 4.4 pounds carbonic acid; but as eighty-four pounds of the live coals would heat and evaporate twelve cubic feet of water, one pound of coals would heat and evaporate nine pounds of water. We thus find by rather a rough process, but from facts correct enough for general reasoning, because derived from operations conducted on the large scale, that the latent heat in carbonic acid gas, is about double the latent heat of steam.

If 37 parts hydrate of lime is placed in contact with 22 of carbonic acid, the nine parts of water in the hydrate will be all expelled, and the carbonic gas combining in a solid form with the lime gives out its latent heat, which being taken up by the water, it escapes in the form of vapor, or steam of superior elasticity to the atmospheric pressure, although its temperature is insensible, this very curious or rather wonderful fact, and others, hitherto, I believe, wholly unnoticed, we shall see amply verified when we examine the properties of cements.

METEOROLOGICAL RECORD

For the month of February, 1836, kept at Avoylle Ferry, Red River, La., (Lat. 31° 10′ N. Long. 91° 59′ w.,) by P. G. VOORHIES.

FEBRUARY.

Days.	Morn.	Noon.	Night.	Wind.	Weather.	REMARKS.
1	32	48	36	calm	clear	heavy white frost
2	30	52	51	..	..	. . .
3	36	60	59	..	..	. . .
4	34	49	46	..	..	. . .
5	40	64	61	..	cloudy	. . .
6	41	61	42	..	..	. . .
7	41	68	61	..	..	. . .
8	33	61	60	..	..	. . .
9	47	62	60	..	..	rain in the morning and all day
10	56	70	65	..	..	rain and heavy thunder—storm all day and night
11	58	70	62	SE	..	Red river rising
12	65	60	58	S	..	rain all day and all night
13	64	62	52	N	..	rain in the morning and clear at noon, Red River on a stand
14	40	63	46	calm	clear	
15	42	68	65	..	..	Red River falling
16	38	64	56	..	..	
17	57	74	68	..	cloudy	light showers all night
18	59	69	59	..	clear	
19	50	71	68	..	..	
20	53	74	67	..	..	cloudy in the evening
21	56	68	64	..	..	
22	60	68	61	S	cloudy	rain all day, clear at night
23	57	69	59	calm	clear	
24	57	72	66	..	..	
25	56	51	50	SE	..	cloudy evening, rain at night
26	50	48	50	NW	cloudy	
27	36	50	51	NE	..	drizzling rain all day and all night
28	40	48	45	..	clear	
29	55	69	71	calm	cloudy	drizzling rain in the evening

Red River fell this month 4 feet 5 inches—below high water mark 9 feet 3 inches

METEOROLOGICAL RECORD

For the month of March, 1836, kept at Avoylle Ferry, Red River, La., (Lat. 31° 10′ N., Long. 91° 59′ w.) by P. G. VOORHIES.

MARCH.

Days	Morn.	Noon.	Night.	Wind	Weather.	REMARS.
1	56	50	43	SE	cloudy	high wind from the north at night
2	32	54	43	calm	clear	heavy white frost
3	32	59	53	..	..	. .
4	34	61	50	S	..	. .
5	45	67	56	calm	..	. . cloudy at noon
6	59	69	68	S	cloudy	high wind from south-east all night and heavy rain
7	57	62	47	N	..	rain all day
8	41	61	52	calm	clear	Red River rising
9	46	62	47	S	cloudy	heavy thunder and rain at noon and all night
10	33	49	47	W	clear	heavy white frost—high wind all day
11	33	64	75	calm	clear	heavy white frost
12	43	69	64	SE	..	high wind from the north-west in the afternoon
13	59	71	68	SW	cloudy	high wind all day
14	61	72	65	S	clear	. .
15	66	78	75	SE	..	. .
16	67	80	78	S	..	. very high
17	69	79	72	..	cloudy	rain and heavy thunder at noon
18	58	68	62	calm	..	rain all night, Red river on a stand
19	60	64	52	..	..	drizzling rain all day and all night
20	46	47	46	..	..	. .
21	48	52	47	..	clear	
22	41	50	45	..	..	
23	34	48	45	SE	..	
24	44	56	48	..	..	
25	48	58	46	calm	..	
26	45	61	57	..	..	
27	43	60	58	..	..	
28	48	71	68	..	..	
29	65	64	70	..	cloudy	drizzling rain all day
30	64	74	76	..	..	
31	64	70	66	..	..	rain at noon

Red River rose this month 1 foot 6 inches—below high water mark 7 foot 9 inches.

METEOROLOGICAL RECORD.

For the month of May, 1835, kept at Avoylle Ferry, La., (Lat. 31° 10′ N., Long. 91° 59′ w.,) by P. G. VOORHIES.

MAY.

Days.	Morn.	No m.	Night.	Wind.	Weather.	REMARKS.
1	70	74	70	calm	cloudy	heavy showers, rain all day and night
2	69	75	73	..	..	.
3	76	76	74	..	..	.
4	74	77	75	..	..	clear in the evening
5	72	75	80	..	clear	
6	68	73	68	W	cloudy	high wind, heavy thunder and rain at noon
7	64	74	72	calm	clear	cloudy at noon
8	66	75	74	..	..	
9	64	74	71	..	..	
10	73	72	66	..	..	
11	61	78	70	..	..	
12	60	79	74	NW	..	
13	64	82	76	calm	..	
14	63	82	74	..	..	
15	64	81	75	..	..	
16	68	86	76	SW	..	
17	70	84	74	..	..	high wind and heavy rain rain at noon from sw
18	71	78	74	..	cloudy	drizzling rain in the afternoon
19	71	76	70	..	..	rain at noon
20	69	78	68	..	..	
21	72	82	78	SE	clear	in the morning cloudy and thunder and rain at noon
22	68	80	82	calm	cloudy	heavy thunder and rain in morning, clear at noon
23	72	82	76	SW	..	heavy thunder . .
24	71	85	72	calm	clear	cloudy in the morning
25	73	76	68	SE	cloudy	rain all day heavy high wind at night
26	64	74	66	NW	..	thunder and drizzling rain all day
27	64	72	65	N	..	clear at noon
28	58	74	71	NW	clear	
29	63	80	76	calm	..	
30	66	86	76	..	..	
31	70	84	80	.	..	

Red River rose this month 2 feet 4½ inches—below high water mark 2 feet 2 inches.

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